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*From*  
**CHICK**  
*to*  
**LAYER**

*Published by*  
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# FROM CHICK TO LAYER

With Complete Feeding Directions  
By Noted Poultry Authorities

*Compiled by*

O. A. HANKE, B.S.A.

*Editor Poultry Tribune*

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These articles have appeared in Poultry Tribune from month to month. In the present form they will serve as an effective reminder of the most important poultry facts. To the authors we are indebted for the use of the articles in this form. Here they will serve their greatest usefulness.—O. A. H.

## POULTRY TRIBUNE SERIES

*Edited by O. A. Hanke*

*Editor Poultry Tribune*

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# The Chick Hatches with a Lunch Basket

*That's Why It Can Be Shipped a Long Distance*

**T**HE baby chick hatches with a 72 hour lunch supply. The yolk, absorbed just before hatching, is stowed away in the body cavity which is the chick's lunch kit.

That is why the baby chick should not be fed for 72 hours after hatching, why the chick can be shipped a long distance, why the \$5,000,000 baby chick industry continues to prosper.

We haven't always known that the chick hatches with a lunch supply. Before we knew, it was customary to feed it soon after hatching. Then the yolk would fail to absorb and the chick would suffer indigestion and diarrhea. After the chick died, on examining it, we would find the unabsorbed yolk.

Somebody else, who for some reason or other failed to feed his chicks, found, in examining the few that died, that the unabsorbed yolk was not present. Probably, he thought, the chick ought not be fed so soon after hatching. As the custom of delayed feeding grew, chick losses diminished. Soon investigators established the scientific fact that the yolk absorbed just before hatching is nature's easily digestible lunch intended for the early feeding period. Just as the calf is supplied, by sucking, with colostrum, an especially rich milk, for several days after being born, so the baby chick is intended to be nourished by mother nature's special food.

Man, in quest for new ways profitably to serve his fellowman, quickly saw the possibilities for commercial expansion in the baby chick business. Why if the chick has a lunch basket he can be shipped, reasoned one poultryman, (he is now called a hatcheryman), and I can surely hatch them cheaper in one big machine than my neighbors can with each of them using their small machines. There isn't so much overhead and besides I can run an incubator better than they can.

A neighbor of his saw the advantage. He didn't have time to hatch chicks and besides he didn't like it. So he bought some chicks. Pretty nice he thought.

**By O. A. Hanke**

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incubators were built to hatch more and more chicks at one time. Soon hatcherymen were setting as many as 100,000 eggs at one setting. Naturally they found it impossible to sell all of these chicks to neighbors. Farther and farther the chicks went because neighbors told other neighbors and the news spread.

It didn't take long and there were a lot of folks in the chick hatching business. How to reach buyers was the problem that faced them. We'll tell other farmers about these ready hatched chicks that can be shipped because they have a lunch basket, the hatcherymen thought.

So they prepared a message for other farmers and published it in some of the poultry magazines. Then, just as now, farmers were anxious to eliminate the hatching nuisance, to forget the setting hen, to buy good chicks, pure breds, at a fair price. Today, as a result, five hundred million chicks are hatched in this way in special chick hatcheries. There are ten thousand hatcheries hatching anywhere from one to 1,800,000 eggs at one setting. Full mail cars packed with chicks being sent by parcel post are rushed across the country.

Interesting isn't it, how these millions of chicks with their natural lunch boxes are shipped in card board shipping boxes especially designed for them, baby chick pullmans some of them are called. When it is cold, the boxes are sent with only a few holes punched in them for ventilation. The heat from the chicks retained in the box keeps them warm. The warmer the weather the less heat necessary and the more holes punched in the box for ventilation.

Comfortably nestled on excelsior these millions of chicks ride the railroads under either parcel post or express regulations. A box containing your chicks is set off at your station. Usually the hatcheryman stamps on the label when chicks may be fed. This is important for sometimes when the chicks reach you, their lunch baskets are not yet empty.

## The Simple Story of the Baby Chick

*(With pictures from life—see opposite page.)*

**T**HE story of the newly hatched chick, how it hatches with a lunch basket packed to supply it with nourishment for 72 hours; how it can withstand the rigors of climate and be shipped many thousands of miles during the first 72 hours of its life is the fascinating story here told for the first time pictorially in Poultry Tribune. You will find it exceedingly interesting.

Many times, perhaps, you've gleaned a vague picture of just what happens in the chick's body before it hatches, but you've never seen it actually portrayed the way the colored picture on the opposite page tells the story.

There in the first picture, you see the newly hatched chick with the plentiful supply of yolk material which is drawn into the body on the 19th day of incubation. You follow down the succeeding pictures. You see the yolk supply diminished as the early hours of the chick's life pass away.

Then farther on, in the last picture, you see that when the chick is 72 hours old, the yolk supply is practically gone. By this time the crop, the gizzard, and the intestinal tract have had time to assume their natural shape and they are ready to digest an artificial supply of food.

A mighty important story is concerned in the picture of this yolk digestion. The yolk material is largely carbohydrate matter. It seems that nature has planned that the embryo of the chick should develop largely from protein and fat. This carbohydrate material, on the other hand, is reserved until the embryo has developed. It is then used to nourish the developed embryo.

Suppose something should happen to retard or altogether destroy the process of yolk assimilation. Suppose the chick in some way or other is so abused that it cannot feed on the yolk during the first 72 hours of life. Then what happens?

A very interesting story indeed. Yolk material is a definite chemical substance. Like other chemical substances, heat and cold easily affect it. A few minutes of over heating or chilling may coagulate the yolk and render it indigestible.

The poor baby chick—imagine it with a yolk coagulated because of over heating or chilling. Its chances to grow and become a sturdy husky pullet or cockerel are vitally affected.

Why? Because coagulated yolk material will not dissolve through the walls of the intestines to be carried by the blood stream to all parts of the body. The poor chick starves to death before it gets a chance to live.

You've guessed by this time, of course, how the chick is over heated or chilled. The mother hen takes pretty good care of her brood. She has the natural instinct to watch it.

But the iron hen, the modern brooder stove, relies on man's natural instinct to regulate it. If man fails to set the stove to operate at the proper temperature, the brood suffers as a result.

It is very important then to have the temperature in the brooder house at a level even with the outer rim of the hover about 95 degrees the first week, 90 degrees the second week, 85 degrees the third week, and so on. It is equally important to operate the brooder several days before the chicks are placed with it, in order to be sure that the stove will function properly and that all its mechanical parts are in proper working order.

The thermostat is probably the most important regulating device on the stove. If it doesn't function, then it is very likely that brooding operations will be unsuccessful.

Fortunately, brooder stove thermostats rarely give trouble. If the operator gives any where near as reliable attention as the thermostat, successful brooding results always follow.

The outstanding facts that you should glean from this story are: when the chick hatches it has enough food in its body to supply it for 72 hours; because of this food supply, it can be shipped a long distance; the chick should not be fed until it is 72 hours old; over heating or chilling in the brooder house are likely to affect the chick's chances of living.—*Editor.*

Price not bad considering I don't have all that hatching bother.

The idea just grew and grew—that was back in 1900 or even earlier. Bigger



# WHY THE BABY CHICK SHOULD NOT BE FED FOR 72 HOURS AFTER HATCHING — IT LIVES ON EGG YOLK

JUST HATCHED



36 HOURS



12 HOURS



48 HOURS



24 HOURS



72 HOURS



LEHLE FILM LABORATORY  
WILMETTE, ILL.



# The Ten Commandments

*Adherence to These Rules Will Bring Salvation from Many Chick Troubles*

**N**OT unlike the people of old, modern farm folk need definite rules to govern their conduct,—especially so with their chicks. That the directions may be definite these ten commandments of chick raising as given by the poultrymen at Ohio State University, are inscribed here.

## I.

### Hatch Early:

"Early hatched chicks grow better, fewer of them die, the broilers bring more money because of being sold earlier on a higher market and the pullets mature in time to lay high priced fall and winter eggs," says G. S. Vickers, Poultry Extension Specialist at the Ohio State University.

It is preferable, Vickers adds, that no chicks be started after May 15, and certainly not later than June 1. The heavy breeds, such as Rocks, Reds, and Wyandottes, should be hatched in March and April; the light breeds, such as Leghorns and Anconas, in late March, throughout April, and the first half of May, if the best results from the mature stock are to be expected in egg production.

All chicks that are to be brooded together should be hatched or secured at the same time, because chicks of different ages never do so well together. Getting all of the chicks at the same time reduces the labor and gets the more tedious part of the brooding over with at one time.

## II.

### Prepare the Brooder House and Move it to Clean Ground:

The brooding quarters should be thoroughly scrubbed and sprayed with some good disinfectant, or whitewashed. This removes all filth and dirt, and destroys disease germs, lice, and mites. The brooder stove should be overhauled, cleaned, and started a day or so before the chicks are put in, to make sure that it is in good running order.

The floor may be covered with from  $\frac{1}{2}$  to 1 inch of coarse sand. On top of this sand some litter of finely cut straw, alfalfa or clover leaves should be placed. Many omit the sand, using the litter only. Care should be taken that the litter is not moldy, or serious losses will result.

Prevention of disease, rather than cure, which is not satisfactory nor successful in most cases, should be the aim, asserts Vickers. For this reason the brooder house should be moved to clean ground where there is a good sod of clover, alfalfa, or bluegrass, and where chickens were not raised the previous year. If this is impossible the bare spots should be limed, turned over, and sowed to some crop. The question of disease-free and worm-free ground on which to rear young stock is one of the most important problems the poultryman has to meet.

## III.

### Provide Sufficient Brooder-house Space and Good Heating Device:

Overcrowding is responsible for many losses in the form of crowding, toe picking, tail picking, etc.

The usual rule is to provide at least 1 square foot of floor space for each 4 chicks. Vickers points out. This means that a 10 by 12 foot house will accommodate about 480 to 500 chicks; if the number is restricted to 400, however, the chicks will develop better. For 500 chicks a 12 by 12 foot or a 12 by 14 foot house would be more suitable.

A stove of sufficient size comfortably to handle the number of chicks being brooded should be provided.

If oil stoves are to be used for brooding, be absolutely certain to get one that will generate sufficient heat to prevent chicks from chilling during cold weather. Electric brooders work very well.

## IV.

### Do Not Feed Chicks Too Soon and Be Careful in Management:

It is safer to give nothing to eat or drink

for at least 36 to 48 hours after the hatch is completed. Many people prefer to wait 72 hours, explains Vickers.

If the chicks are hatched at home, it is a good plan to leave them in the incubator until time to feed. If chicks are purchased it is all right to leave them in the chick boxes until feeding time.

Care should be taken to see that they are not set next to a stove or radiator where they will overheat and smother. Neither should they be set in a draft where they will chill.

In removing the chicks to the brooder house see that they do not get chilled. When the chicks are put in the house the temperature should be about 100 degrees Fahrenheit; 1 foot from the stove, and about 2 inches above the floor. The corners should be filled with wire or straw or otherwise blocked or rounded off to prevent crowding in these corners. If the temperature is high enough close to the stove and the house is of sufficient size the chicks will find the temperature most suited to them.

If the weather is cold and the winds strong, trouble may be experienced in keeping the chicks warm unless they are confined in a  $\frac{1}{2}$ -inch-mesh wire netting enclosure arranged about 2 or 3 feet around the outside of the hover, and thereby confined to the warmest place in the house. Roofing paper is also used to some extent. Care must be taken to see that this enclosure is removed or enlarged if the weather moderates and it becomes too hot in the enclosure.

The temperature of the house should be regulated according to the actions of the chicks.

Ordinarily, the temperature can be reduced about 5 degrees a week, and after 8 or 9 weeks no artificial heat will be needed except during cold nights.

## V.

### Feed a Complete Well Balanced Whole-some Ration:

Each state has its own popular chick ration. By writing to the State Agricultural College in your state, (see page 28) you can secure the ration recommended by your state poultry department. Two famous chick rations in general use are the Cornell (New York) mash and grain chick ration and the Wisconsin all-mash ration. They are given in boxes on page 6 of this book.

Every year more chick raisers are learning that commercial chick feeds offer an easy way to solve the chick feeding problem. Each sack contains all the necessary ingredients of the ration. All of the shopping around nuisance is eliminated. To save worry, time and money try a commercial chick mash this year.

Where the chicks must be confined over 2 weeks indoors, according to Vickers, cod liver oil should be added to the mash. To each 100 pounds of feed add 1 quart of cod liver oil. Mix the oil in a small amount of feed and then mix this small amount with the larger amount which is to be fed. It is always safer to use a better grade of oil unless the cost is prohibitive. As soon as the chicks can be outdoors in the sunshine the cod liver oil can be discontinued.

Practical poultrymen and investigators are agreed that milk is one of the necessary constituents of a ration. Milk not only results in better growth, but it reduces the mortality. It should be fed at least for the first 8 weeks, or until the broilers are sold, and it is preferable that it be fed all summer.

The rations listed explain what proportion of milk to use. The proper use of the various forms is also explained.

An abundance of green feed should be given at all times, Vickers maintains. It contains the vitamins which are necessary to secure the best growth, it helps to keep the digestive system in good order, and is an important factor in the prevention of nutri-

tional troubles such as canker, colds, and nutritional roup.

## VI.

### Get Chicks Outdoors as Soon as Weather Permits:

Although we have learned how to grow chicks indoors, this method is not nearly so economical, and probably will not result in as strong birds as when they are allowed outdoors on good range. When indoors, expensive additions must be made to the diet to correct for the lack of sunshine. Provided the weather permits, they should be outdoors, for at least part of the day, after the first week or 10 days.

Getting them out in the direct rays of the sun will prevent leg weakness. For the first few days and until they learn to know where the source of heat is they should be confined to a small yard. After they know enough to go indoors to the source of heat they should be allowed free range. While they are still young they should be confined in the mornings until the grass is dried off.

## VII.

### Rear Young Stock Away from Old Stock:

The chicks should be moved far enough away from the old birds that they will not mix and range on the same ground. *If this is impossible they should be yarded separately.* The former is much more desirable. If running on the same range the old birds may be a source of infection for such diseases as coccidiosis, tuberculosis, cholera, and many others.

## VIII.

### Separate the Cockerels from the Pullets as Soon as Possible:

The cockerels should be separated from the pullets as soon as possible, and certainly not later than at 8 to 10 weeks of age. Many of the cockerels will be large enough to be sold as broilers at this time. The remainder should be put by themselves and grown to broiler size as soon as possible, because the broiler prices go down as the season progresses. This separation comes at a time when the brooding quarters are becoming crowded, anyhow. If a large percentage of the chicks are raised, something must be done to relieve the crowded conditions.

If breeding cockerels are to be saved, about twice as many as will be needed should be selected at this time so as to allow for a second selection in the fall when they are mature. Select the quick developing birds which have bright eyes, broad backs, deep bodies, and relatively short legs. Don't select the slow maturing dull eyed, long necked, narrow backed, long legged birds for breeders. These few selected breeders may be allowed to run with the pullets.

## IX.

### Have the Pullets Fat in the Fall:

On most farms, pullets constitute more than half of the flock. The profits from these pullets will depend largely on how many eggs they produce. The condition they are in at the beginning of the production year will determine in a large measure how many eggs they produce during the year, and particularly during the fall and winter months when eggs are high in price.

Pullets, therefore, should be in the best possible condition when they start laying in the fall.

## X.

### House the Pullets When They Begin to Lay, and Not Later Than October 1:

Moving pullets after they have started to produce nearly always results in a set-back and a cessation of production.

In order to prevent this the pullets should be moved to their permanent winter quarters as soon as the first pullet eggs are secured.



# of Chick Raising

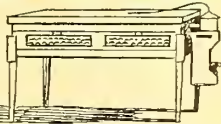
By O. A. HANKE

I

*Hatch Early*



Use an

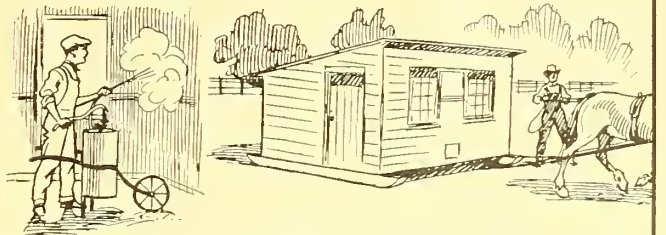


or Buy



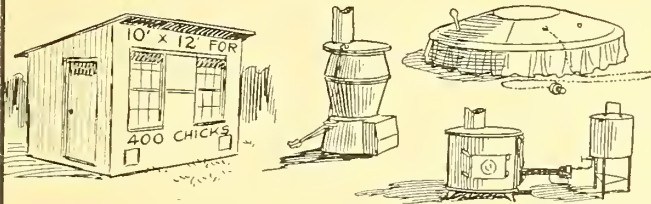
II

*Prepare the Brooder House and Move It to Clean Ground*



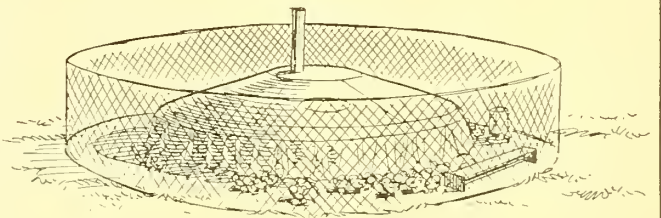
III

*Provide Sufficient Brooder House Space and Good Heating Device*



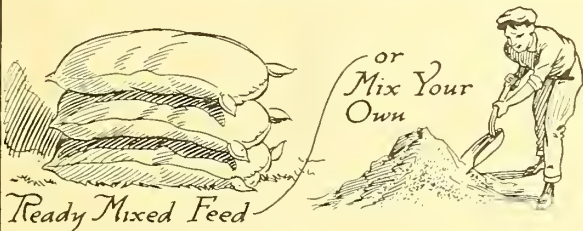
IV

*Do Not Feed Chicks Too Soon and Be Careful in Management*



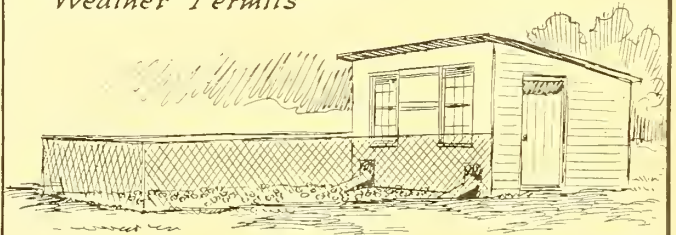
V

*Feed a Complete, Well Balanced, Wholesome Ration - The Ohio Ration*



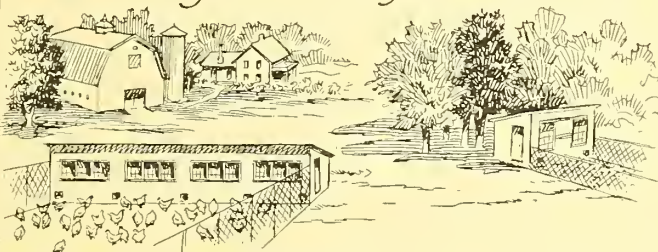
VI

*Get Chicks Outdoors as Soon as Weather Permits*



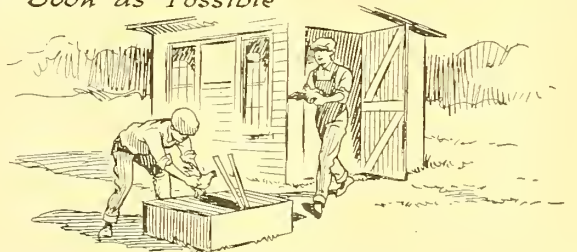
VII

*Rear Young Stock Away from Old Stock*



VIII

*Separate the Cockerels from the Pullets as Soon as Possible*



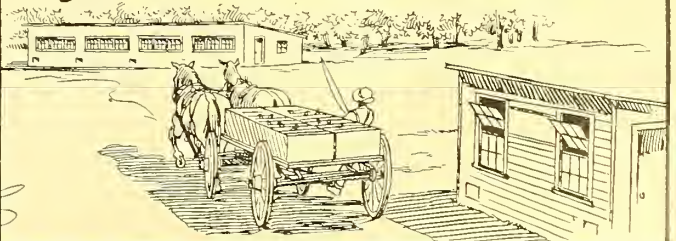
IX

*Have the Pullets Fat in the Fall*



X

*House the Pullets When They Begin to Lay, and Not Later Than October 1st.*



OH +  
Garcia



# How to Raise 85% of Your Chicks!



Just from the hatchery, a box of 100 baby chicks. Cared for according to this guide, at least 85 of them will grow to maturity

## A Complete Chick Raising Guide for the First Six Weeks

By O. A. Hanke

### A—Plan for Early Chicks

1. Early hatched chicks grow faster and mature in time to lay many eggs for the high priced June to November egg market.
2. You need to start three chicks for each pullet you wish to place in the laying house this fall.
3. If you are home hatching, for every 200 pullets desired one 300-egg incubator set twice or a 600-egg incubator set once is required. Seventy-five breeders, or one for each 2.6 pullets, are required.
4. Whether you home hatch or buy ready hatched, arrange for good chicks—pure breds with production records. Well bred chicks will produce greater profits through faster growth and more eggs.
5. Always operate the brooder for three days before you place chicks with it. The temperature at the hover edge should be 95° first week, 90° second week, 85° third, etc.
6. Place clean shavings, finely cut hay or straw on the floor for litter.

### B—Arrange the Brooder House

1. A modern brooder house is almost essential.
2. An 8x12 house or its equal in a round house will provide sufficient room for 400 chicks.
3. Commercial ready-built brooder houses, either round or square, metal or wood, are very satisfactory.
4. If you used a brooder house last year, remove all the fix-

tures, scrub the floor with a solution of Lewis lye and spray the walls with a good disinfectant.

5. Always keep the brooder house away from the old hens. Baby chicks must be on clean ground each year.
6. Arrange the brooder house to be portable so you can pull it on clean ground with a team.

### C—Use a Good Brooder

1. Be sure the stove is big enough. Rarely is it satisfactory to brood more than 400 chicks in one lot. Use a 1,000 chick brooder to do so. For a 500 chick brooder, 200-250 chicks is about right.
2. There are three kinds of heated brooders, oil, electric and coal. Ordinarily in the northern United States a coal burner is best for early brooding. The new large oil and electric brooders supply enough heat and are coming into common use. Except in a few northern states where there may be some question, oil and electric brooders are satisfactory for all season brooding. In the south, they are very popular because of the absence of coal. A 1,000 chick size hard coal brooder will burn 15 to 20 pounds of coal a day.
3. In this manner 400 chicks can be brooded more easily and more successfully than 100 with clucks.

### D—Simple Management Rules

1. Like human babies, baby chicks should sleep until they are about 70 hours old. The yolk, which the chick absorbs just before it hatches, supplies it with food.
2. Leave the chicks in the chick boxes and keep them dark until they are about 70 hours old. If placed in the brooder house before it is time to eat, they will pick up litter; they also may develop toe picking habits.
3. Dip beaks in lukewarm milk or water when placing chicks with brooder. Supply grit on clean newspapers or cardboard.
4. Confine the chicks to brooder with a wire guard. This keeps them from wandering away and being chilled. Place wire guard about three feet from the edge of brooder hover entirely around stove.
5. Always feed a little at a time and often.
6. Chicks are comfortable at night when they form a "sleeping ring" just outside of the brooder hover.
7. Clean the house frequently and replenish with clean dry litter.

### E—What to Feed and How

1. Little chicks need a well balanced ration including proteins, carbohydrates, fats, minerals and vitamins.
2. Commercial chick rations are very satisfactory. They are endorsed by thousands of poultry raisers and by numerous college men. Even though they cost a little more they are worth it. Furthermore, during the first twelve weeks, the danger period, the chick eats only eight pounds of feed. A difference of one dollar a hundred pounds only amounts to eight cents per chick. A few additional chicks saved easily pay for the additional cost. If you feed a commercial chick ration simply follow the manufacturer's directions.
3. Some folks prefer to mix their own chick feed. They may choose to use an all-mash ration or a grain and mash ration. One of each kind is listed.

### WISCONSIN ALL-MASH CHICK RATION

An all-mash chick ration perfected by the University of Wisconsin is as follows:

80 pounds ground yellow corn.  
20 lbs. Standard Wheat Middlings.  
5 lbs. Ground Raw Bone (a).  
5 lbs. grit (any commercial grit high in calcium carbonate).  
1 lb. common salt.  
Skim milk (†) used freely—no water first two or three weeks.  
Cod Liver Oil (b) two pints to 100 pounds mash when chicks do not get direct sunlight. (Sunlight, coming through window glass is of no value; glass substitutes may admit enough sunlight to protect chicks.)

(†) Condensed buttermilk, dry skim milk or dried buttermilk may be used. Follow manufacturer's directions. Usually add 20 to 30 pounds to this mixture.

(a) Trade name for product. Manufactured by packers. It is dry and will not spoil. High grade steamed bone meal may be substituted.

(b) Ration taken from Bulletin 371 Agricultural Experiment Station, Madison, Wis.

Place mash before chicks in hopper five times a day first week, and gradually increase until it is before them constantly in open hoppers.

### THE CORNELL GRAIN AND MASH CHICK RATION

A grain and mash mixture recommended by Cornell University is as follows:

#### GRAIN MIXTURE (Third Day to Second Week):

5 lbs. cracked corn (fine).  
3 lbs. cracked wheat.  
2 lbs. pinhead oats, steel cut oats, or oat flakes.

#### GRAIN MIXTURE (Second to Eighth Week):

6 lbs. cracked corn (medium).  
4 lbs. wheat.

#### MASH MIXTURE:

25 lbs. yellow corn meal.  
20 lbs. wheat bran.  
20 lbs. wheat middlings.  
10 lbs. fine ground heavy oats.  
10 lbs. fine ground meat scrap (50-55 per cent protein).  
5 lbs. bone meal.

10 lbs. dried milk products (use part dried buttermilk, or if liquid or condensed milk is available, omit dry milk from ration).

½ lb. fine salt.

Provide fine grit and oyster shell from the start. When chicks do not get direct sunshine (not through glass), mix one per cent of medicinal cod liver oil in the mash (about one pint to 100 pounds of mash.)

Third day to second week feed grain three times a day, moistened mash twice a day between grain feedings.

Second to eighth week, grain morning and night, moistened mash at noon. Mash mixture in hoppers four to six hours a day and gradually increased until available all day. (For complete directions send for Extension Bulletin 45, Cornell University, Ithaca, N. Y.)



# Control Coccidiosis with Milk

*A Disease With a Long Name and a Longer Death Rate*

**By Dr. W. A. Billings**

*University of Minnesota*

## **Germ Enters Through Mouth**

Since the germ is taken in by way of the mouth, the digestive tract or intestines are the first to be affected by this disease. The germs enter with the food or water and are carried on down into the intestines. Some of them lodge in the caecum or "blind gut."

This is a two-pouched affair in the lower part of the chicken's intestine, and compares with your appendix. The chicken has two, while we, thank good-

with a bloody material. This in itself, together with the fact that the birds are about a month old, is oft times sufficient to make a positive statement of the disease. However, if you are still in doubt, it might be well to consult the veterinary department of your state university.

How to tell it from White Diarrhea—keep in mind that white diarrhea occurs during the first few days of the chick's life, while coccidiosis usually appears

after the chick reaches two or three weeks of age. Then too, the enlarged bloody caecum and bloody diarrhea point to coccidiosis.

I expect that, like almost every one else you are especially interested in learning how to treat the sick birds. My best treatment for ALL sick chickens is a good sharp ax used early and often. This seldom fails.

However, the first thing to do in order to prevent the spread of the disease is to separate the sick ones from the healthy ones. Kill all those that have one foot in the grave.

## **Move to Fresh Ground**

If you are using a brooder house, try to move it on to a clean spot and thoroughly clean and disinfect the floor of the house and especially the drinking and feeding utensils. These dishes should be scalded daily.

Don't bother much with drug treatments. So far as we know, these are of little or no help. They also tend to create a false sense of security. Some new mineral feeds are reported to be of value.

## **What to Feed**

Next, stop feeding whatever you are using at the time and substitute the following mixture:

Dry skim milk or dry buttermilk.....	40 pounds
Wheat bran .....	10 pounds
Yellow corn meal.....	30 pounds
Ground barley.....	20 pounds

Start feeding this as soon as the disease first appears.

If for some reason you cannot provide this ration, take away all other feed and feed only soured or condensed buttermilk or liquid skim milk. Keep either of these feeds up until the deaths stop, and then gradually add more solid feed. Whatever feeding plan you use, provide plenty of it. Green feed as usual and last, but not least, do not neglect to keep the dishes clean each day by scalding. Keep the brooder house floor covered with clean litter daily.

We have found this feeding plan of great value. It may not produce a miracle in all cases, but it is very helpful and brings about many cures. If you

**I** PRESUME some of you who read this article, or others of a like nature, sometimes wonder why such jaw-breaker names are selected. I will not try to explain because it is too long a story and it's too late to change it now. The damage is already done.

If you ever have this trouble among your chicks, I don't think you will have any difficulty in remembering the name.

Let's try to pronounce it correctly anyway. It goes something like this—COCK-sidi-osis. Some of these names one needs almost to gargle in order to make them sound like anything. After all, what's in a name, we are more interested in other things.

Coccidiosis (say it out loud) may be classed as one of the "children's diseases" of chickens. It is a contagious disease and is NOT caused by improper feeding or anything of that nature. Some people may ask how it "gets on their farm." It is often impossible to answer that question—there are too many different ways. If we did know that, it would help a lot in controlling an outbreak. Coccidiosis is caused by a parasite or "bug" which the chicks pick up from the soil. Wet seasons seem to help the germ to grow faster. Last season, for example, was especially bad.

## **Different from Diarrhea**

Try not to confuse this disease with Infectious White Diarrhea. They both may cause a diarrhea, but remember always that White Diarrhea usually affects chicks under a week old.

After the chicks have successfully weathered the first week or ten days of their life, the next thing they have to contend with is this disease with a long name and a higher death rate. Coccidiosis is becoming more common each year. It is most commonly seen in birds from two weeks to two months of age—just when they are starting to shed their fuzzy swaddling clothes.

After they are two months old, the losses are usually of no account. The death rate at first is high, and then, after a few days, it may drop and continue at a low rate for several weeks. You can readily see that one or two infected birds may easily infect many others because the germ passes out through the droppings.

In the beginning the healthy chicks pick up the germs from the contaminated soil or from dirty feed and watering dishes. Since the germs pass out by means of the droppings, great care must be taken to keep these vessels clean and sanitary. Don't, for goodness sake, have water dishes that permit the birds to sit on the edge and pass droppings into the water or milk as the case may be.



This picture shows the size and appearance of birds commonly affected with coccidiosis.

ness, have only one and that is often more than we need.

The germ sets up housekeeping here and multiplies or increases in numbers. This growth sets up a severe inflammation of the appendix, and the nearby portions of the intestines, causing an appendicitis.

Now then, the most natural thing to expect would be for the birds to have a diarrhea and this is usually of a bloody color, due to the severe inflammation. In other words, up to this point, the condition is quite similar to what we would expect if a small boy had eaten a peck of green apples in the early summer.

## **Symptoms are Peculiar**

So far as the symptoms of Coccidiosis go—we cannot depend on them too much. First consider the age. The birds must be from two to eight weeks of age. We have a high death rate. This is often accompanied by a bloody diarrhea. The birds may drink a lot and frequently appear sleepy.

Death follows in a few hours after the symptoms become noticeable or there is a slim chance that, if the bird does not die, it may recover and become a carrier. By this is meant that while the bird may appear all right, it still carries the germs in its intestines and may pass them off to infect other healthy birds.

Suppose you have sick birds of the dangerous age which look and act about as I have described (the picture accompanying this story will give you some idea of the size and appearance of chicks sick with this disease). The next thing to do is to examine a dead bird.

## **Examine Intestines**

Look over the intestines carefully. They will be found to be very much reddened and the caecum or appendix will be enlarged or swollen and filled



want to use an antiseptic in drinking water, try potassium permanganate. Put enough of the powder in the water to turn it a deep wine color—that is if you can remember what wine used to look like. Make a fresh solution each day, because after it is exposed to the air for a while it loses its strength.

#### Wire Floor Helps

There is another method of control that might be mentioned here. This is to make a raised false floor in your brooder house using for this purpose hardware cloth (coarse wire screen) of about three-eighths of an inch mesh. This tends to keep the floor more sanitary because the infected droppings pass through the wire netting on the floor underneath. If you use the raised hardware cloth floor, do not use any litter. The birds are placed directly on the wire cloth. Do not use finer than three-eighths inch mesh as it will clog up and be useless.

Best of all—if your brooder house is portable, move it on to a clean patch of ground. If your brooder house is not movable, try to make it so. It can be moved every few days and will save a lot of trouble. This is a great deal easier than to try to disinfect the ground about the brooder house.

#### HER PROFIT, \$5 PER BIRD

A flock of 130 Rhode Island Red hens owned by Mrs. E. W. Levitt of Bethany, Nebr., returned her an average profit of \$5.00 a bird last year. The price of the total produce sold was \$1,100.00 and the cost of feeding, caring, etc., was \$450.00. This left her a total profit of \$650.00.

Mrs. Levitt started raising Rhode Island Reds in 1918. She buys ready made mash and scratch feeds, and feeds a lot of wheat and oats. The average yearly production of this flock is 190 eggs. She has a high producing flock, because, she thinks, she culls for type, vigor and production. She has been culling for the last five years. She culls for color because she sells eggs and stock to breeders.

In the future, Mrs. Levitt expects to cull for egg production only. Her chicks are vaccinated. She also gives potassium permanganate to baby chicks in the water as it serves as a disinfectant of the alimentary canal.—Y. P. B., Mich.

#### FORCE FEBRUARY CHICKS; THEY MOLT ANYHOW

No matter how they are fed, February hatched birds can always be expected to go into a molt in the late fall, according to poultry specialists of the New Jersey Agricultural College. They can use the period of fall moult for any increase in weight which has not been accomplished previously.

Inasmuch as the aim of the poultryman is to get the early pullets into production as rapidly as possible, feeding should be done accordingly. A good baby chick ration should be fed until the eighth week, after which a laying ration containing a higher percentage of mineral than ordinary laying rations do, should be given. With a feeding system such as that, birds will make the maximum body growth, and attain sexual maturity as well, at an early date.

# More Sanitary to Brood Chicks on Wire

By D. C. Kennard

**T**HOUSANDS of chicks die each year because of contamination with diseased droppings or musty litter in brooder house. The false wire floor, devised by the Ohio Experiment Station, is of considerable value in reducing losses occasioned by either of these two causes.

The accompanying illustration shows how a false wire floor can be built in a 10x12 portable colony brooder house, and used in connection with a coal stove or oil heated brooder.

The same plan can be adopted for the large hot waterheated brooding plant or for any size or type of brooder house except those which are round. For round brooder houses a commercial wire floor has been placed on the market.

While each brooder house presents a somewhat different problem, certain general principles apply to all; the frame should be made of such size and arranged so as to be handled conveniently. The frames are made of 1"x6" boards set edgewise so the wire will be kept a sufficient height above the floor even if the wire does sag as it often does.

As many of the frames should be made the same size as possible so they will be interchangeable.

The top inside edges of the frames are beveled and the frames are spaced  $\frac{3}{8}$  to  $\frac{1}{2}$  inch apart as indicated by the heavy black line which surrounds each frame. This reduces the area for the lodgement of droppings.

#### Bevel the Edges

Both corners of the top edges of the center supports are beveled to  $\frac{3}{8}$  or  $\frac{1}{2}$  inch in width for the same reason. The floor frames are covered with  $\frac{1}{2}$ -inch square mesh hardware cloth.

This hardware cloth comes in rolls 30 or 36 inches wide and can usually be procured from the local hardware dealer at about four to five cents a square foot.

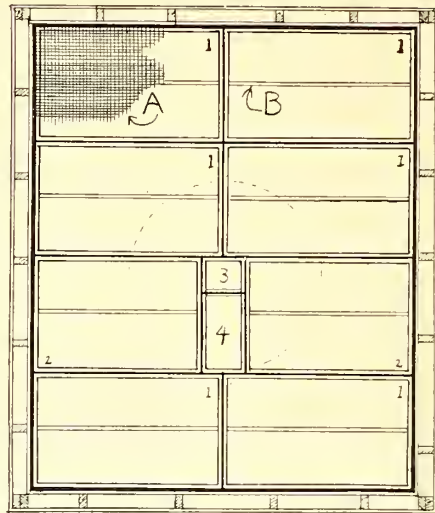
Before installing the floor frames, the brooder house needs to be sheathed on the inside of the studding just above the floor, so the frames will cover the entire floor space. A 1"x12" board nailed to the inside of the studding will serve the purpose. The spaces between the studding at the top of the board are closed by 1"x8" boards slanted upward from the top of the side board to the outside wall to keep the chicks out and prevent them from perching.

#### Easier to Clean

With this system of housing, cleaning is less laborious, because it need not be done so frequently, and because the droppings do not become packed and adhered to the floor. However, handling the floor frames is an additional cost, which will largely offset the gain in this respect.

A temptation and a mistake is to neglect to remove the droppings at regular intervals of one to two weeks, even if the heat of the brooder keeps them dry and keeps down the odor.

By the use of wire panels or even the floor frames set edgewise, one section of the house can be cleaned while the chicks occupy the other part. If the floor frames are properly constructed and arranged, no difficulty should be



PLAN FOR SCREENING A 10 x 12 COAL STOVE BROODER HOUSE

1. Floor frames about 3' x 5' with center support B to prevent wire from sagging.
2. Frames about 3' x 4 $\frac{1}{2}$ '.
3. Frame about 1' x 1' for supporting stove. The exact size to be according to dimensions of the base of stove. Since the stove sets on this it need not be screened.
4. Frame about 1' x 2' to fill in the space just back of the stove.

All frames made of 1" x 6" boards placed edgewise and covered with  $\frac{1}{2}$  inch square mesh hardware cloth. The center supports may be made of 1' x 4' pieces if desired.

This plan is for a house with a 10' front and 12' from front to rear. If the house has a 12' front and is 10' front to rear the same plan is used except that the frames are about 2'-6" wide and about 1' longer and placed edgewise from front to rear instead of from side to side.

experienced in their removal or replacement in connection with the cleaning process.

Before replacing the frames after cleaning, the floor should be covered with about a half inch of shavings, peat moss, agricultural slag or sand. This will serve as an absorbent, deodorant, and will aid in cleaning.

#### CARE OF THE HOME INCUBATOR

The operation of the home incubator should be left to one person. If more than one person attempts to attend to the incubator, irregularities detrimental to the hatch will very likely occur.

The lamp of the incubator, if it is a type in which an oil lamp is used, should be attended to regularly. It should be filled once a day and the wick should be cleaned at the same time. Some types of incubators are so built that filling and trimming is not necessary every day.

It is a good practice to do the filling at a time when the eggs are not taken out of the machine in order to avoid the danger of touching eggs with oily hands or of exposing the eggs to poisonous fumes. Before the lamp is taken out for refilling, the height of the flame should be observed, and when the lamp is replaced the new flame should be turned to approximately the same height in order to be fairly sure of maintaining an even temperature. About an hour after fixing the lamp, the temperature of the incubator should be checked and adjustment should be made if there is any variation.



# What Does It Cost to Raise Pullets?

*It Mainly Depends on Your Brooding Success*

By L. M. Klevay

## To Find the Cost

1. Take two inventories, one at the beginning and one at the end of the year. The inventories should include everything used for rearing, but not the value of the chicks themselves.
2. Record all costs of rearing, including hatching eggs purchased or secured from the breeding flock.
3. Record all returns of rearing, including cockerels sold, used or retained. Pullets sold or retained are not considered.
4. Deduct the returns from the costs. This figure represents the *working capital* which is required to rear the pullets and none of which is returned to the operator until the pullets are placed in winter quarters.
5. Charge interest on one-half of the working capital for six months at 6 per cent and add to the working capital. The result is the net cost of rearing.
6. Divide by the number of pullets reared to find the cost per pullet.

**P**LANNING to raise pullets is, in many respects, like arranging a train-trip. Just as we usually inquire about the cost of the fare before taking a trip, so it is advisable to investigate the approximate cost of raising pullets before we buy any chicks, that we may plan our business accordingly.

The cost of raising pullets includes incubation, brooding and rearing expense. Careful records must be kept all through the growing period.

Even before the chicks are on hand, an inventory must be taken of the equipment to be used in brooding. The form shown in the third column is satisfactory. Each item to inventory should be listed under the proper head. This is just a schematic layout.

The value of the brooder stoves, feed, litter, feeders, fountains and other equipment used should be established before starting operations. The buildings, if new, should be charged against the rearing business without deduction. Old buildings should be inventoried at a normal rate of depreciation. At the end of the rearing period, the equipment is reinventoried and any decrease in it is charged against the rearing as a *cost*.

The inventory value of the equipment is based on what could be received, if ample time were allowed for selling. Under normal conditions, the inventory at the end of the rearing period would be less than at the beginning. That difference would constitute a decrease in inventory and would appear as *cost* in the summary. If extensive repairs were made, or new equipment were added, the second inventory would be higher and there would be an increase which would appear on the *returns* side of the summary.

Feed, coal, disinfectants, litter, leg bands, and other supplies will appear on the rearing expense sheet, unless a quantity

of these necessities is on hand at inventory time. If some are on hand, they must be included in the inventory both in the beginning and at the end of the rearing period. Any difference between the first and the second figures will be either a loss or a gain. A *loss* will be charged up as rearing expense while a *gain* will have to be entered as a rearing return. (No. XI.)

## Cost of Rearing Pullets

Expenses which must be accounted for are: rent on the land used, or a proportion of the taxes on the whole farm; interest on money invested in the business, usually 6 per cent; and a proportionate share of the insurance.

Figuring feed cost is comparatively easy when ready mixed feeds are used. In home mixed rations, the value of all the ingredients must be established. Purchased ingredients are figured at cost plus freight or express, while home grown

Items:	INVENTORY					
	Beginning of Period Date Nov. 1			End of Period Date Oct. 31		
	Number or Amt.	Price	Value	Number or Amt.	Price	Value
I. Real Estate..						
II. Feed on Hand for Rearing..						
III. Litter .....						
IV. Equipment Supplies.....						
Total.....						

materials are charged up at local prices. The fairest way of figuring the cost of home grown feeds is to use the price which may be obtained for them at the local market. Market quotations do not always represent the true home value.

## Chick Cost Figured Too

The value of chicks placed under the hovers is charged up to miscellaneous rearing expense (VIII) and when birds are sold as cockerels (VI), broilers (VII) or roasters (VIII), or are placed into the laying house at an established value they are entered as income (returns). *In this way, the total rearing cost includes the cost of the chicks.*

Where the chicks are bought from a hatchery their value is known definitely, but where they are home hatched a value must be established. This can be done by keeping an accurate account of incubation expenses, and charging a fair profit. Some poultrymen prefer to include incubation in the rearing accounts. In such cases the incubating equipment is inventoried with the brooding materials. The incubator operating expenses are also included in the rearing account.

## Labor is Charged at a Definite Rate

The time required to "do the chores" must be either definitely recorded or estimated. By charging the labor against the operation a more true rearing cost can be established. Some poultrymen do not like to charge for their time. Such poultrymen figure the entire profit as labor income.

Keeping a daily record of mortality is a very effective check on efficiency. It is very easy to forget how many chicks have died and unless a large number die at once nothing may be done to improve conditions.

COST OF REARING PULLETS				RETURNS			
Cost		No. or Lbs.	Value	Returns		No. or Lbs.	Value
I. FEED—(Home grown or purchased)				I. Feed bags sold			
Grain.....				II. Feathers sold			
Mash.....				III. Manure (Recovered from houses)			
Shell.....				IV. Feed sold or transferred			
Grit.....				V. Chicks sold *			
Charcoal.....				VI. Cockerels sold, used or retained *			
Milk.....				VII. Broilers sold, used or retained *			
Green feed.....				VIII. Roasters sold, used or retained *			
Beef.....				IX. Equipment sold or transferred			
II. LABOR				X. Miscellaneous returns			
Man hours @ .....				XI. Increase in Inventory (if any).....			
Horse hours @ .....				Total returns.....	X		
Equipment hours @ .....							
III. TAXES—(Proportionate share land, buildings, stock, equipment)				Total cost of rearing.....			
IV. INSURANCE—(Proportionate share buildings, stock, equipment).....				Total returns (except pullets retained or sold as layers).....			
V. POULTRY FEES AND DUES—(Proportionate share).....				Working capital.....			
VI. WATER—(Proportionate share)				Interest on half working capital for 6 months.....			
VII. INT. ON AVE. INVESTMENT @ 6%.....				Net cost of rearing pullets..			
VIII. MISCELLANEOUS EXPENSES—				Number of pullets retained or sold as layers.....			
Hatching eggs purchased or used.....				Cost per pullet.....			
Cost of chicks if purchased							
Fuel (for incubation and brooding).....							
Litter.....							
Freight and express.....							
Market packages.....							
Shipping tags.....							
Telephone and Telegrams							
Commissions.....							
Hauling feed (outside labor).....							
Railroad fares.....							
Postage.....							
Stationery.....							
Advertising.....							
Disinfectant, medicine, sprays, etc.....							
Equipment purchased (hatching and rearing)							
Leg bands.....							
New buildings.....							
New fences.....							
Repairs and depreciation							
Seeds (for ranges).....							
Miscellaneous rearing costs.....							
XI. DECREASE OF INVENTORY (if any)							
TOTAL COST OF REARING.....	X						

## EXPLANATORY NOTE

\* For determining the true "Cost per Pullet" a business in selling chicks, cockerels, etc., other than disposing of the normal surplus, should not be recorded on this form. † If "Returns" entered are "Net," make no charge here.

The reproduction of a pullet rearing record on this page shows how the various items are entered and their relation to the whole account. In one column are entered all the costs; in the other all the returns. Under costs are listed all the supplies needed in raising chicks including the cost of chicks themselves and the decrease in inventory. If there were an increase in inventory it would appear on the *return* side. Under returns are listed all the items which constitute incoming cash. Market poultry sold, eaten or held over for future consumption must be entered as income. The larger the returns from items other than pullets, the lower the cost of producing the pullets. The "easy-to-figure" table shows how the various items can be calculated. In order to figure the per cent of chicks raised, per cent mortality, and other unknown factors, the known item, such as the number of chicks started and raised, should be looked up on the record of rearing.—From "Practical Poultry Production," published by John Wiley Sons, New York.

## Easy-to-Figure Table

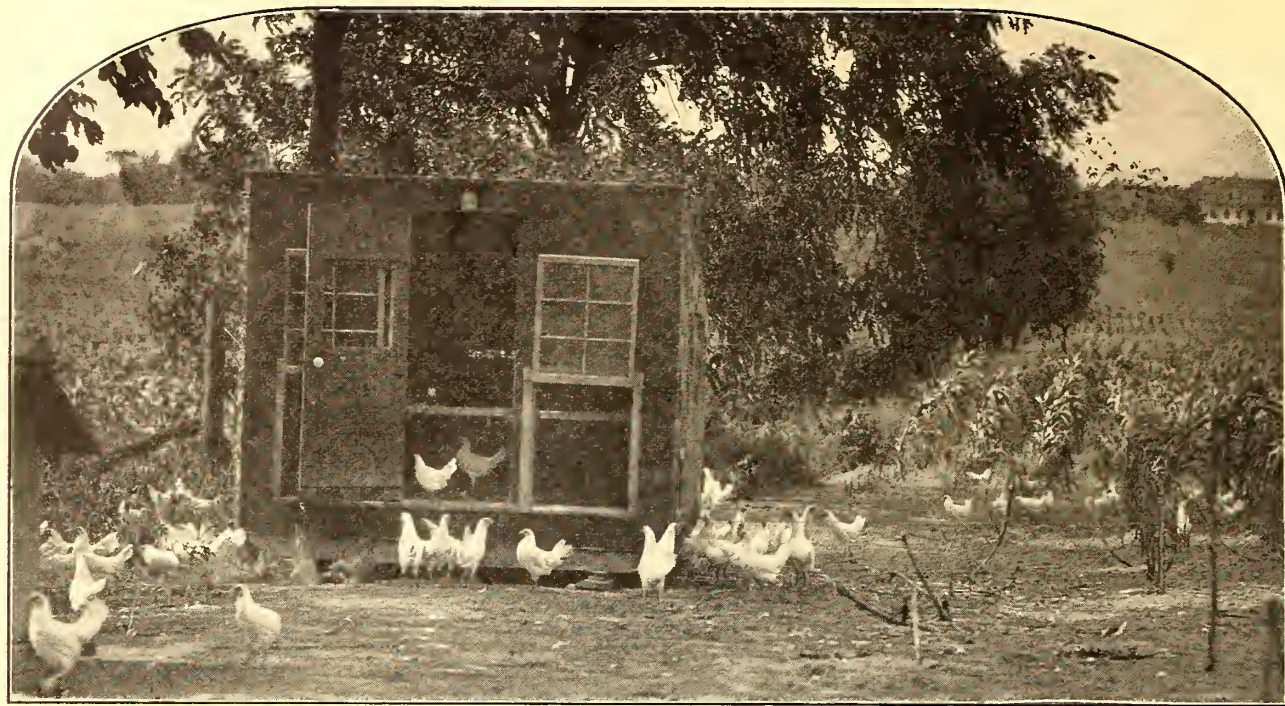
- a. Number chicks started
- b. Number chicks raised
- c. Number pullets raised to housing age
- d. Per cent chicks raised
- e. Per cent mortality
- f. Per cent of chicks started raised to housing age as pullets
- g. Net cost of rearing pullets (get from cost of rearing sheet)
- h. Cost per pullet
 
$$b \div a \times 100 = d$$

$$100 - d = e$$

$$c \div a \times 100 = f$$

$$g \div c = h$$





With shade, water, green feed, and growing mash in abundance these pullets are happy. The house must be closed each night to keep out predatory animals.

# Fresh Ground insures Good Pullets

Place the Brooder House on Clean Soil—Away from the Old Hens

By O. A. Hanke

**T**O ATTEMPT to raise this year's crop of chicks on old ground is as foolhardy as going to sea without a life preserver. When storms of intestinal parasites and coccidia beset the precious cargo of growing chickens, then the poultryman, like the sea captain during an ocean tempest, wishes that he had prepared by carrying a life preserver, namely, in the poultryman's case, new fresh soil.

Every year chick losses from intestinal parasites increase. From every part of the land come complaints that it's harder than ever to raise chicks. "I get them up to three or four weeks of age, and they then get droopy and stay thin. They just won't grow," is the report many farm folks make.

And why? Because, for the last ten or fifteen years, perhaps more, on most farms young chicks have been grown on the same soil each year. In many cases they've been allowed to roam with the old hens.

When you stop to think that many of the diseases which lie dormant in old hens, immediately become active when the germ is implanted in the tender body of the chick, it is easy to explain why chick losses on many farms are so high.

Dr. B. A. Beach, Veterinarian at the University of Wisconsin, has this to say, "Intestinal worms are exceedingly prevalent in Wisconsin chickens. So prevalent, in fact, that some poultry farms are faced with the necessity of either changing their methods, or going out of business. Since most of the diseases of birds between three and ten months of age, are

either directly or indirectly caused by worm infestation, a special effort should be made to prevent them from becoming infested."

## Must Change Methods

What are the changed methods that poultry farms are facing?

They are faced with the necessity of growing their young stock on fresh ground—ground on which neither young growing chickens or old hens ranged last year. Really not a difficult requirement, is it? Yet due to carelessness and neglect, thousands of chicks will die again this year, simply because their owners didn't take the precaution to move their brooder house out on to new soil.

Dr. Beach says, "Every effort should be made to prevent the young stock from becoming infected with intestinal parasites." It really isn't a big effort that is required, either. If your brooder house is portable, but doesn't have skids on which it can be moved, buy a couple two by six runners and place them under the poultry house. Then hitch a team of horses on the house, and pull it out at the edge of the corn field, in the orchard, perhaps in the night cattle pasture, anywhere so as to provide fresh ground.

Isn't it possible to accomplish the same thing by plowing up the runs around the old location of the brooder house? It will help some, authorities say, but the surest precaution for success, is to move the house on fresh ground.

If the brooder house is stationary, placed on a concrete foundation, then, of course, plowing of the ground around the house will help some. Besides

plowing the ground, it will be necessary, however, to work in considerable ground limestone. This has the ability to sweeten the soil and make life unfavorable for the soil parasites.

## Old Soil Invites Trouble

If you do not move your brooder house this year, the chances are you will be troubled with coccidiosis and intestinal parasites in the form of round worms and tape worms. When you stop to think that from coccidiosis the loss is usually 50 to 75 per cent, and that intestinal parasites sap the vitality of the growing pullets, so that they are delayed in coming into production, and possibly suffer a loss of 50 to 75 eggs in potential egg production, then it is easy to appreciate the importance of putting forth this special effort to move the brooder house. It's all so easy. Much easier than to be troubled with parasites all through the growing season.

It will help, too, if you will move the brooder house once more this summer, after you move it now. Out on the range or wherever you place the brooder house, there is a chance for the soil to become contaminated close to the house, because that is where the chicks spend much of their time. It is possible to limit this contaminated area by placing the water fountain and the outdoor mash hopper a considerable distance from the brooder house. Then the droppings are spread over a wider area. Move the brooder house once more, later in the summer. It need be moved but a short distance—just enough to get away from the contaminated area.



# How to Fight Poultry Worms

Roundworms and Tapeworms Give Trouble

By Dr. R. Graham

University of Illinois



Fowl Roundworm

**T**HE losses caused by intestinal worms in farm flocks are generally under-estimated. A better understanding of the worm problem in poultry follows when premises become so heavily infested that raising of chickens becomes unprofitable.

This is precisely what has happened on many farms. The heaviest losses are generally experienced in young stock.

Worm infestation in growing stock indicates the presence of worms in mature fowls as well as infective microscopic worm eggs in and around the chicken house. The examination of chickens submitted for diagnosis during the past five years shows that a majority of flocks suffering from other diseases harbor either roundworms or tapeworms.

## Young Stock Most Susceptible

In chickens under six months of age, intestinal parasites frequently cause loss of flesh and wasting which terminate in death. In adult fowls, a continuous infestation of worms over a long period is marked by similar symptoms which may prove fatal. Fowls harboring a mild worm infestation may not show visible symptoms, yet increased susceptibility to other poultry ills has been recognized. Lowered vigor from worm infestation, tho often overlooked, is more serious in the average farm flock than the direct losses incurred.

## Worms Poison Chickens

The prevailing opinion that intestinal worms exert the chief damage thru absorption of nutrient is not confirmed thru the study of infested flocks. The absorption of nutrients from the host is secondary to the damage resulting from irritated and inflamed intestines that become permanently thickened and interfere with the normal digestion and assimilation of food. Proof of this condition is found in the failure of many fowls to improve in condition following the expulsion of intestinal parasites by worm remedies.

In appraising the damage done by worms in many flocks it seems advisable to recognize the role of intestinal worms in the production of two poisons that may be absorbed into the circulation along with non-specific poisons in the digestive tube. One of these poisons appears to be capable of destroying red blood cells resulting in anemia marked by paleness of the wattles and comb.

## Essentials in Worm Control

THE following essentials in sanitation and medication are presented as a guide in keeping flocks free from worms and to influence favorably the secondary losses resulting from worm infestations. Results obtained in worm control are generally in keeping with the degree of efficiency of sanitary measures employed. There can be no short cuts. The objective is to keep worm eggs from contaminating food and water, and to expel the worms from infected fowls. Following their expulsion they should be disposed of by burning.

1. Raise young stock in clean brooder houses or fresh grass, clover, or alfalfa range not occupied by poultry for one year.
2. Clean and disinfect chicken house in order to protect fowls against eggs that have reached the infective stage. Wood, or preferably, concrete floors, together with dropping boards facilitate cleaning and make disinfection possible. It is impossible to disinfect a dirty house. Good lye—1 pound for 40 gallons of boiling water—aids in cleaning, followed by a reliable disinfectant applied by spray.
3. Provide double yards for mature fowls so that the unoccupied lots can be planted and cropped. Fresh ground is better than medicine in preventing parasites in mature fowls.
4. Employ sanitary drinking and feed containers. Keep house dry.
5. Do not under estimate the importance of preventing worms or the losses incurred by them. A correct diagnosis is the first essential in any treatment. Worm symptoms are often obscure and indefinite. Consult a qualified veterinarian for the diagnosis and treatment.
6. Reliable worm remedies are valuable in expelling worms and should be used to give temporary relief in infected flocks. Worm remedies have no effect upon the egg or its development. Some are also poisonous and should be used cautiously to avoid aggravating an existing ill.
7. Confine chickens for worm treatment, cover the floor with straw, treat the flock as per directions of the veterinarian, and on the following day place the flock on clean ground. Clean the house and burn the straw. This will destroy large numbers of worms and eggs that might serve to re-infest the flock. Repeat the treatment and continue, at all times, the practice of poultry sanitation. The essentials of this plan have been outlined by the Extension Service of the Illinois College of Agriculture. It is recommended for application on all farms where worm troubles appear.



Fowl Tapeworms

West. Many flocks suffer from both round and tapeworms of one or more varieties. Weakness, paleness of the comb, diarrhea, paralysis, wryneck and discoloration of the eyes are frequently suggestive symptoms in either roundworms or tapeworms. An accurate diagnosis can be made only by autopsy and examination of affected fowls.

The symptoms observed in worm infestations may also be observed in other diseases, and are therefore misleading to many flock owners. Sometimes symptoms of worms are quite obscure, and the nature of the ailment is not even suspected even tho it has prevailed in the flock for weeks or months.

## Diagnose First

Giving remedies on suspicion in poultry diseases is a hazardous procedure. The results are disappointing and the losses incurred are sometimes serious.

Furthermore, resorting to medication frequently gives a false sense of security, followed by lack of attention to essential sanitary measures. Complication and injury are not uncommon results of improper treatment. A correct diagnosis is therefore the first essential to successful treatment.

Roundworm remedies are of no avail in tapeworm infestations while tapeworm remedies are useless in treating roundworms. In neither case do these remedies destroy the egg, the fountain head of reinfestation. Experience has shown that worm treatments cannot correct faulty feeding and housing, or check the inroads of some low-grade disease in the flock. Also it should be remembered that all worm remedies are more or less poisonous and remedies with a wide range of safety should be selected and administered with caution.

Losses following treatment for worms may be traceable to improper medication, or the result of subjecting fowls that are suffering from some other disease to worm medicines. The wrong treatment for a flock is worse than no treatment at all. In many cases a correct diagnosis can be obtained only by laboratory examination to check or clarify the autopsy findings.

A doubtful diagnosis should always be checked by laboratory tests. Diagnosis by mail is commonly in error as well as expensive and unsatisfactory to the owner. In many localities the local

The other poison possesses an affinity for the motor nerve centers and brings about symptoms of paralysis.

## Symptoms of Worms

Two types of roundworms and several varieties of tapeworms, or flat segmented worms, are found in poultry in the Middle



veterinarian is rendering a valuable diagnostic service thru autopsies conducted on the farm. Consultation during outbreaks of poultry diseases is always advisable.

How Chickens Get Worms

When worms are found in the droppings or in the intestines at autopsy it is an indication that fowls have had access to feed or water contaminated with the eggs of intestinal worms. Stated in another way, infective microscopic worm eggs are present on the range or in the houses. Worm eggs can survive many months under natural conditions in the chicken house, or in the ground on the chicken range. Moisture and filth are favorable to their existence.

The Common Roundworms

The microscopic eggs of chicken roundworms are passed out in the droppings of infested fowls in large numbers. If moisture and temperature conditions are favorable the egg undergoes certain changes and ultimately a small embryo or larva is developed in the egg. In this stage the egg is known as "infective." It requires about ten days under favorable conditions for the larva or embryo to develop in the egg.

Until the embryo is developed, the egg is not infective and will not produce roundworms in fowls if taken in with food or water. Less favorable conditions for roundworm eggs, such as winter weather, delays the development of the egg to the infective stage. Freezing does not destroy the egg. It is capable of remaining dormant to continue the process of development when under favorable moisture and weather conditions.

The Infective Roundworm Eggs

If a roundworm egg in the infective stage is taken in with food and water the shell is dissolved, releasing the young larva worm or embryo in the digestive tract. At this point it undergoes several changes. A part of the development is occupied by burrowing into the lining mucous membrane of the small intestine. Finally the embryo appears as a mature worm. A period of 50 to 70 or more days is required for it to develop after entering the small intestine as an egg. The complete cycle of roundworm development in poultry under the most favorable conditions requires approximately 70 to 80 days and in many cases a much longer time. The mature worm lays a large number of eggs which pass in the droppings, and the cycle of growth is repeated when conditions are favorable. Unlike the roundworm egg in swine and man the common roundworm in fowls develops in the intestinal tract without migrating via the circulation to the lungs.

Tapeworms Have Intermediate Host

Tapeworms, unlike roundworms, have an intermediate host in which a certain period of their development is spent. The intermediate hosts of fowl tapeworms are not completely understood. Evidence has been submitted to show that the housefly as well as the snail are intermediate hosts for certain fowl tapeworm species. Other insects are probably involved, but positive proof is lacking.

Tapeworms can be distinguished from roundworms thru their flattened segmented character, together with the fact that they are firmly attached to the lining of the intestines.

The terminal segments of the tapeworm (3 to 20), containing eggs are

Score Your Growing Range

RANGE SCORE CARD  
A Dozen Points to Check Your Range  
(Prepared by Poultry Tribune)

	Scale of Points	Score of Your Range
1. Fresh Ground: Ground upon which neither old hens nor growing chicks ranged last year	15	.....
2. Separate Range: Never allow growing pullets and laying hens to run together.....	5	.....
3. Adequate Range: Not over 700 4 months old pullets per acre. If any indication of worms, use commercial worm remedy.....	9	.....
4. Green Stuff: An adequate supply of tender green stuff such as rape, oats, barley, alfalfa, clover.....	7	.....
5. Proper Ration: A well balanced growing ration and oyster shell or suitable mineral mixture supplied in weather protected, no-waste hopper.....	15	.....
6. Separate Sexes: Remove cockerels at eight weeks or sooner.....	5	.....
7. Sanitary Conditions: Clean house every two weeks. Spray for mites. Examine pullets for lice. Avoid water puddles around house. Move brooder house several times during season to avoid excessive soil contamination around house. Weather proof hoppers can be placed with water in shade at distance from house. This lessens contamination.....	10	.....
8. Drinking Space: Two good sized drinking fountains for each house. Growing stock needs plenty of water.....	7	.....
9. Feeding Space: Allow two inches of mash hopper feeding space for each bird after eight weeks old.....	5	.....
10. Roosting Space: Four inches of roosting space per pullet between 8 weeks and 4 months of age.....	5	.....
11. Ventilation: Ventilators arranged to allow air circulation, especially at night. Avoid drafts.....	9	.....
12. Protection: From enemies, sun and storms. Shut in pullets at night to protect from predatory enemies. (See Biddy Cackle page 51 for suggestion). Supply shade, either artificial or from cornfield and trees.....	8	.....
Total.....	100	.....

NEW JERSEY HAS SEVEN POINT PROGRAM

"Wage War on Worms and Disease" is the slogan adopted by the poultry specialists of the New Jersey State Agricultural College, who suggest seven "words to the wise" in a campaign against disease in this state.

"Hatch or Buy Chicks Early" is the first. Figures from the farm egg-laying contest for 5 years show that chicks hatched before May 15 produced 75 eggs the first six months from November to May, and those hatched after May 15 produced 68 eggs for the same period.

"Keep Brooder House Clean." The steps suggested for cleaning a brooder house thoroughly are: first, scrape the floor, thus removing all accumulated droppings and litter; second, sweep the ceiling, wall, and floor, third, scrub the floor, side walls, and window sills with hot lye solutions; fourth, clean all brooding equipment; and fifth, after the house is dry spray with an approved disinfectant.

"Provide Clean Range or Close Confinement." By clean range is meant ground on which no chickens have been raised for at least a year and where no poultry manure has been scattered for at least two years.

If room is so limited that clean range cannot be provided, close confinement is recommended.

"Keep Old and Young Stock Separate." Do not let the youngsters come in contact with the laying stock which may be carrying the germs of coccidiosis

complete units capable of reproduction. If consumed by an intermediate host certain stages of their development occur. After a period of time in the intermediate host, they grow to maturity only after entering the digestive tract of a fowl.

When the tapeworm egg in the infective stage in an intermediate host

and roundworm while being apparently healthy.

"Build Screen Manure Pit." This will partially eliminate the common fly which is a fruitful source of worm infestation.

"Supply Wire Dropping Boards." As dropping boards furnish a good source of infection, these should be screened to prevent the birds from walking on the droppings. A 1½ inch mesh wire stretched tightly beneath the roost poles is recommended.

"Clean Dropping Boards Daily." From May to October, droppings should be cleaned from the boards and placed in the screen manure pit.

\* \* \*

Advantage of Eight Weeks Pullets

There is no worry with brooders, cold nights, wet days and all the rest of the things incidental to chick raising when eight weeks old pullets are bought.

Those who are not particularly skillful in raising chicks, whose losses due to mortality run too high, can still have plenty of pullets in the fall by buying eight weeks old stock. Specialists who are equipped to raise chickens on a large scale can raise pullets to eight weeks of age cheaper than those who are not equipped for it. And pullets raised under the best conditions according to scientific methods stand a better chance of becoming profitable investments.

The average quality of pullets produced by large specialty breeders can be better than that of those raised by small individuals.

such as the fly enters the digestive tract of fowls it attaches its head to the lining of the intestine and proceeds to develop and grow. Infested fowls pass the segments in the droppings. Without the proper intermediate host, tapeworm eggs remain non-infective. In prevention this phase of the cycle enables an effective point of attack.



# PREPARING for a High



# PULLETS Flock Record

This article distinctly discusses:

1. Range Sanitation
2. Feed Requirements
3. Early Hatched Pullet Problems
4. Late Hatched Pullet Problems

**S**ANITARY runs and proper feeds are absolutely necessary, if growing pullets are to develop the high vitality necessary for heavy egg production.

Many poultrymen who experience trouble with their young stock in the form of indigestion, "going light" and intestinal worms, attribute their difficulties to the feed. Investigation in many of these cases traces the origin of the troubles to contaminated runs.

As a remedy, some recommend new runs each season or the use of two sets of runs, using one set every other season. Excellent methods, but impractical in many cases!

Another method is to plow the runs, turning the contaminated top soil under. This method gives good results when done thoroughly but it has the objectional feature of making the runs disagreeable in wet weather.

Probably the most satisfactory remedy, in most cases, is to cover the runs for a distance around the brooder houses, or where the birds travel the most, with an inch or more of gravel. This covers the contaminated soil and permits fresh contamination to leach down quickly.

It is never too late to clean up the runs. Beneficial results will be noticed immediately.

## Study Feed Requirements

The object in feeding growing pullets to mature into heavy layers is to encourage a steady growth with ample bulk of feed to distend the digestive organs, developing them to their full size and strength capable of handling large amounts of feed necessary later for heavy egg production.

Highly concentrated feeds develop the sexual organs, encouraging quick maturity.

Bulky feeds develop the digestive organs and the body, lengthening the growing period. The proper proportion of both kinds of feed is necessary for the best results.

It is difficult to give set feed formulas due to the wide variations in the quality of the ingredients obtainable. *It is sufficient to say that any mash mixture that gives good results in egg production will serve equally as well as a growing mash with slight alteration sometimes necessary to meet special conditions.*

## Variety of Feed Essential

The grain mixture should consist of two or more different kinds of grain of which no one kind constitutes more than 50½ of the mixture. Adhering to this simple rule alone will assist much in maintaining

By F. St. John



*Upper*—This hen was an early hatched pullet fed to retard maturity as described. She was large and well matured when she began laying in the late summer. After laying heavily for several weeks she was sent to the Michigan National Egg Laying Contest where she continued to lay steadily without a break, making a record of 299 eggs in 365 days. *Lower*—Pullets raised on a clean range develop a sturdy vitality very noticeable in their smooth plumage and solid flesh. They are usually heavier than their appearance indicates. Pullets raised on contaminated ground lack this smoothness of plumage and are often very disappointing in size when matured.

health, good appetites and steady growth in the pullets. One kind of grain fed largely or entirely soon dulls the appetites.

On a whole, the pullets will do best when given all the feed they want of both cracked or whole grain and mash after the first few weeks permitting them to balance their own ration of the two.

One method that gives excellent results with limited range is to feed the chicks mash in open hoppers, all they want up to the age of six or eight weeks, feeding the grain in limited quantities. After that age the grain is also fed in open hoppers, and kept before the birds at all times.

One of the best methods I have used for chicks on free range, is to feed the mash in open hoppers for the first three weeks feeding no grain whatever. After that age, the grain mixture is also fed unrestricted in open hoppers. This method has the advantage of eliminating much of the trouble from clogged digestion due to the chicks overeating on mash, especially with Leghorns during the critical period from three to eight weeks of age when the strain of growing feathers is the heaviest.

Mr. St. John is a famous Missouri White Leghorn breeder whose birds have made enviable records at egg laying contests and on his home plant. These results bespeak his qualifications to prepare this special article for Poultry Tribune readers.

The natural tendency of the early hatched pullets is to grow and mature quickly, due to the stimulating effect the cold weather has on their appetites, also in many cases due to lack of exercise. Cold and stormy weather early in the season discourages them from using their outdoor runs.

## How To Feed Early Hatched Pullets

If they are permitted to grow and mature quickly in this manner their muscles are soft and their stamina is impaired although they may be healthy and thriving.

This quick growth often brings the pullets into laying at an immature age. This stunts their growth, reduces the size of their eggs; and their lack of stamina prevents them from laying heavy for long periods. Such pullets are inclined to stop laying in the fall, to molt and recuperate their strength, making them unprofitable as winter layers. To prevent such conditions the early hatched pullets should be induced to use their outdoor runs in every manner possible. Placing the water and feed outdoors on fair days helps.

Their feed should be altered, especially the mash, to possess more bulk which will decrease the quantity in weight consumed. This can be accomplished by adding wheat bran or gray shorts to the mash. From 10% to 50% of the mash can be substituted with the bran or shorts.

Bran or gray shorts swells when it comes in contact with water and the digestive juices. It distends the digestive organs to their full size and satisfies the appetites with less nutriment. It also reduces the animal protein in the mash, and this contributes to slower maturity.

Wheat should be eliminated or at least fed in very restricted quantities to the early hatched pullets, as of all the common grains it is the most effective in hastening maturity.

## How to Feed Late Hatched Pullets

The late hatched pullets have much the opposite conditions to contend with. Warm weather takes the edge off their appetites.

The late hatched pullets can also be given a supply of bran or shorts fed in separate hoppers, not mixed with the growing mash, permitting the pullets their preference in the amount they eat.

Sour milk has a stimulating effect on their appetites, if fed in limited quantities the amount they will clean up quickly two or three times a day.



# How to Get the High Priced June-November Eggs

By O. A. Hanke

## Keep the Layers Going

### 1. The body weight must be up to standard.

Rocks 7½ pounds. Wyandottes 6½ pounds. R. I. Reds 6½ pounds. Leghorns 4 pounds. Anconas 4½ pounds. Orpingtons 8 pounds. Many birds molt because they are not fed enough to maintain body weight. When a hen quits laying because of insufficient feed she begins molting.

### 2. The ration must be well balanced and complete.

It must contain protein, carbohydrates, fats, minerals and vitamins. Animal protein is necessary for continuous summer production. Use either meat scraps, tankage or milk in some form. Commercial feeds solve the feeding problem easiest because there are no mixing worries.

**HOME MIXED MASH:**  
100 pounds ground corn  
100 pounds ground oats  
100 pounds Wheat Middlings  
100 pounds Wheat Bran  
100 pounds Meat Scraps\*  
3 pounds salt

\*A good grade of tankage may be substituted for meat scraps, or 50 pounds meat scraps and 50 pounds dried buttermilk. Skim milk or semi-solid buttermilk may be used.

**HOME MIXED SCRATCH:**  
200 pounds shelled or cracked corn  
100 pounds wheat or heavy oats  
Light breeds 9-10 pounds scratch  
grain per day  
Heavy breeds 10-12 pounds

Provide oyster shell in hoppers and commercial mineral mixture according to manufacturers directions. Supply rape, oats or barley for range. Keep mash hopper always open and well filled.

### 3. The feeding and housing system must appeal to the layers.

Tempt them with a moist mash at noon. Feed the grain after it has been soaked in water for 24-36 hours. It is more palatable and appetizing. Feed no grain in the morning.

Since the layers must eat twice as much mash as grain keep them confined until ten o'clock, so they eat mash. Provide for good house ventilation by front and rear ventilators.

Fresh, cool water is very important. Hens can't lay without it.

Keep the house cool so layers will go in to eat or, if this cannot be handled satisfactorily, move some hoppers out under trees. Clean the house frequently and spray for mites. Dust or dip the hens if they are lousy.

### 4. The percentage production must be high.

If profits are to be good 50-60% production must be maintained. In the average flock frequent culling will be necessary. If the previously suggested methods have been followed remove birds that quit laying. See page 15 for directions.

Broody hens must be marked with leg bands, broken up and, if they persist in going broody, be sold. Broody hens should be confined immediately and fed heavily on dry and wet mash. Confine for three days and nights in slate bottom coop without nesting material. A hen that goes broody three times cannot make a high record.

Hens cannot lay heavily if they have worms. When worms are suspected (most flocks have them) use a good reliable worm remedy regularly.

## And Start the Pullets Off

### 1. Leghorn and Ancona pullets should begin laying at 6 to 6½ months.

Heavy breeds require 7-8 months. January hatched light breed pullets should be laying by July if properly grown. If they show comb development now, feed heavily on corn to lay on fat. They need the reserve. If they weigh nearly four pounds, feed more animal protein to start them laying. Bring them into laying quarters before they begin laying. Fat pullets lay large eggs. Feed regular laying ration with addition of corn to keep up weight. Confine pullets for several weeks and then turn out afternoons. Put nests on floor to start.

### 2. When these molt, later hatched pullets should start laying.

These early layers will probably molt in October or November. Their summer production, however, will be very profitable and their eggs will be valuable for hatching too.

Hurry these later hatched birds along with a commercial growing mash or home mixed laying ration shown above with protein content regulated according to time of hatching and rate of maturity. A good mineral mixture should be supplied.

### 3. All pullets require good range care.

Supply green range on which pullets were not grown previous year, nor old hens allowed to range. Watch out for worms. Use reliable worm remedy.

Supply fresh water and growing ration. Ventilate range house properly. Spray house for mites. Clean house at least every two weeks. Shade is important.



### Follow Economical Production with Efficient Marketing

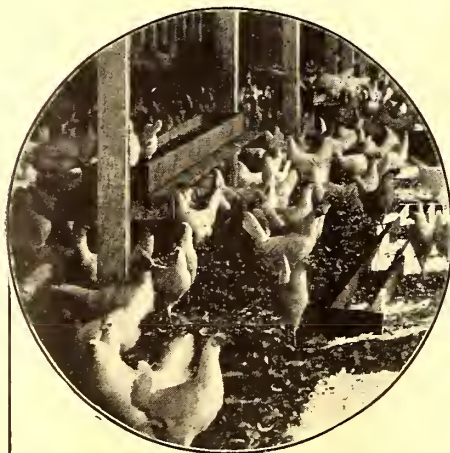
After the eggs are produced they must be sold at the highest possible price

Gather the eggs at least twice a day and store in a cool, dry cellar.

Infertile eggs go to market in better condition, therefore allow no males with the layers. Ship to a reliable commission merchant or join a cooperative marketing association, if one exists in your territory.

A nearby small city often offers a fine outlet for a quality product.

Parcel post marketing direct to city customers has some possibilities.



EFFECT OF TIME LAYING STARTS ON FUTURE PRODUCTION

Time started to lay	No.	Per Cent	Eggs before Nov. 1	Winter Eggs	Total for year
July 15-31	13	1.17	41.0	29.7	150.3
Aug. 1-15	30	2.7	39.9	26.8	150.7
Aug. 16-31	32	2.88	27.0	32.0	160.8
Sept. 1-15	51	4.6	19.4	32.17	159.7
Sept. 15-30	29	2.6	18.0	31.3	157.2
Oct. 1-15	57	5.13	11.0	33.5	157.6
Oct. 16-31	86	7.74	3.7	36.8	158.0
Nov. 1-15	151	13.6	...	42.9	160.2
Nov. 16-30	137	12.3	...	37.8	146.0
Dec. 1-15	143	12.9	...	35.3	151.1
Dec. 16-31	132	11.9	...	29.8	146.2
Jan. 1-15	113	10.1	...	24.1	137.9
Jan. 16-31	78	7.0	...	15.1	125.3
Feb. 1-14	35	3.15	...	8.7	107.5
Feb. 15-28	12	1.08	...	5.5	96.7
Mar. 1-15	10	0.9	...	...	91.7

Pullets maturing between November first and fifteenth have the highest yearly total, but pullets maturing earlier lay almost as many eggs and produce them during the high priced June-November season.

—Courtesy Missouri Experiment Station.



# CULLING SIMPLIFIED!

## How to remove the loafers from your flock

A new method developed by

**J. Fred Roser**

Sixteen years a practical poultryman



Mr. Roser proves the trap nest record of this Buff Rock pullet. He is showing that only two fingers could be placed between the lay bones. She had been broody four times before May 1st.

**H**OW OFTEN should we cull our chickens?

This question has been asked thousands of times, and to this question I answer that you should cull your chickens three hundred and sixty-five times a year.

It is necessary to be continually on the lookout for the loafers and the slackers. Often a hen that is producing fairly well today may go wrong in a few days and cease to lay enough eggs to pay for the feed she consumes.

It is claimed that a hen must lay 120 eggs in one year to pay for the feed she eats during that time.

You must bear in mind that competition is so keen in the poultry world these days, that we who raise chickens for pleasure or for a livelihood must be right up on our tip-toes all of the time or we will be numbered with the thousands of men and women who have made a failure in their poultry venture.

The title of this article "Culling Simplified" means that, to cull out the loafers, the slackers, the non-producers or the hens that pay too little interest on the investment is a very easy matter when you understand the characteristics which stand for a good layer.

There is one item or feature which counts for more in culling chickens than all other characteristics combined, and that is the flexibility of the pelvic or lay bones, located on either side of the vent.

### The Lay Bones Tell!

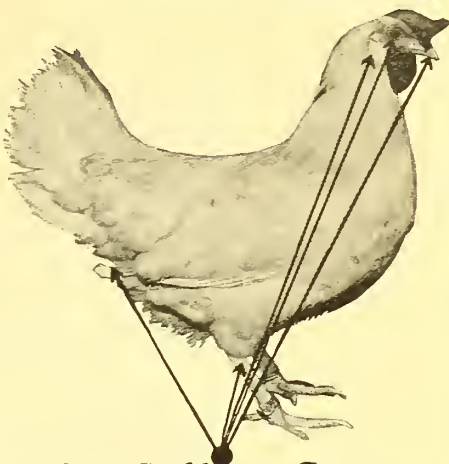
To get this idea firmly fixed in your minds let me say that during the ten years I have culled chickens I have met many men and women who rank high in the art of culling, and when I asked their opinion as to the one characteristic which would out-rival all other ways of telling a good layer from a bad one, they invariably answered, "The flexibility of the pelvic or lay bones."

**THAT'S CULLING SIMPLIFIED!**  
—To be able to tell a good layer by the lustre of her feathers, the length of her toe nails, the length and color of her beak, the color of her shanks, the flexibility of the abdomen and the distance between the lay bones and the keel bone, is a wonderful thing—but to do a good job of culling and to do it quickly let your judgment be governed entirely by the thinness and flexibility of lay bones.

Every time a hen lays an egg these lay bones spread apart and push outward. If she is a poor layer these bones become rigid and then it is almost impossible for her to lay an egg. In a case of this kind, the lay bones lose their flexibility and

### When Culling, Consider:

Time of Year  
Age of Bird  
Physical Condition of Bird  
Condition of House  
Kind of Feed Used  
Condition of Range  
General Management



## Color Culling Guides

### Time to Fade After Bird Begins Laying:

	Yellowish White	Very White	Bluish White
Vent.....	½ month	1 month	3 months
Eye Ring.....	½ month	1 month	
Ear Lobe.....	½ month	1 month	
Beak.....	1 month	2 months	4 months
Shanks.....	2 months	5 months	8 months

This applies only to yellow skinned breeds such as Leghorns, Anconas, Rocks, Reds, Wyandottes and not to Minorcas or Orpingtons

### THE HENS TO KEEP:

Those that are healthy, vigorous, active, good eaters, with plump, bright red combs.

Those having a large, moist vent, thin pliable pelvic bones spread well apart; a wide spread between pelvic bones and rear end of keel bone; birds with large, soft pliable abdomens.

The late molters.

In breeds with yellow skin and legs the hens should have pale or white legs, beaks and vents in the late fall.

### THE HENS TO CULL:

All hens that are sick, weak, inactive, lacking vigor, poor eaters, with shrunken, hard, dull or whitish-colored combs.

Those with thick, stiff pelvic bones that are close together; small spread or distance between rear end of keel and pelvic bones; small, firm or hard abdomen; birds with a small puckered and yellow vent.

Those that have molted or are molting prior to September 1st.

Do not use any one point as a positive indication but by combining these points and studying the birds you will soon be able to determine easily whether a hen is laying or not.

become rigid. The egg organs cease to function, and when this happens all the high protein feeds in the world will not cause this hen to lay an egg.

### Can Cull Pullets Too

The pullets should be culled in the fall before placing them in their winter quarters.

All pullets of low vitality should be culled out on general principles and, above all, every pullet having stiff lay bones should be taken out no matter how beautiful she may look; for no pullet having rigid pelvic bones will lay enough eggs in a year to pay for half the feed she consumes.

During the sixteen years I have been raising chickens along scientific lines every hen that has made a high trap-nest record has had flexible lay bones and a loose, flabby vent, and abdomen.

Every hen whose trap-nest record showed only 60 to 100 eggs per year had stiff lay bones and a tight vent.

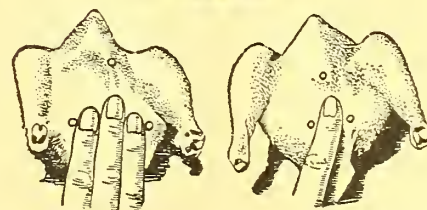
### Moist Faded Vent Indicates Layer

A few days ago we killed a six-pound Buff Rock pullet whose sisters had been laying for some months. This pullet had very stiff lay bones, her shanks and beak were yellow, her feathers had a bright lustre—yet we could get three fingers between the lay bones!

To the novice, the inexperienced, this test would indicate that she was laying, though the stiffness of the lay bones and the tightness of the vent were sure signs that she was NOT laying, and probably had not laid for months. When we dissected this hen we did not find a trace of an egg because the organs of production had ceased to function. They had dried up, and this caused the pelvic or lay bones to become stiff.

This experience should convince every reader of the Poultry Tribune that there is nothing magical or mysterious about culling chickens.

### MR. ROSER'S TEST ILLUSTRATED



Upper—Examining the pelvic or lay bones.  
Lower—The lay bones are on either side the vent. The drawings illustrate their position in a layer at left and non-layer or cull at right.



# How to Avoid Fall Poultry Diseases?

**C**ERTAIN poultry diseases are seasonal. Thus we may look for an increased number of digestive troubles among our birds in the hot weather, bronchial troubles in the early spring and

## Roup      Canker Chicken Pox Diphtheria Bronchitis Contagious Catarrh

By Dr. B. F. Kaupp

Poultry Pathologist, North Carolina  
State College

while drinking, this antiseptic will kill the germs and thus protect the birds that follow. Permanganate water should be used for infectious catarrh, canker, roup, and in bronchitis. For the injections through the nose there are many preparations such as mentholated essential oils.

### Canker or Diphtheria

Canker or diphtheria is shown in Figure 2. This is the roof of the mouth of a chicken that has a bad case of canker or diphtheria. The disease is caused by

a germ; hence it is contagious. It is a filterable virus and therefore cannot be grown in visible quantities in the laboratory; but it is there, and it will not only by laboratory tests reproduce the disease



winter, sore throat in the spring time, fowl typhoid and cholera in the mid-summer, and the roup group of diseases in the fall and early winter. The fall group of diseases are discussed here.

### Infectious Catarrh

Infectious catarrh may occur without the complications of sore eyes, sore head, or canker of the mouth. It may occur in a very severe form as shown in some studies made in our own laboratories some years ago. In this case there were six fine cockerels sent into this territory from the west. The birds had somewhere been exposed to the contagion, possibly enroute, and apparently had been carelessly handled by express companies, a thing that quite frequently happens. When the birds arrived they were in a pitiable plight and were sent to the hospital maintained in connection with the laboratories.

There was an amber colored discharge from the nose. A strong baking soda solution was used to dislodge the discharge before injecting a mentholated solution into the diseased part. One teaspoonful of baking soda was dissolved in a half teacup of hot water. This, when injected into the posterior part of the nose and forced forward, caused the disgorge of at least a teaspoonful of an amber looking semi-fluid material—the products of inflammation. After thus cleaning the parts, the medicine was then injected into the nose so that it passed through from the front nose opening to the slit in the roof of the mouth. Four of the birds recovered.

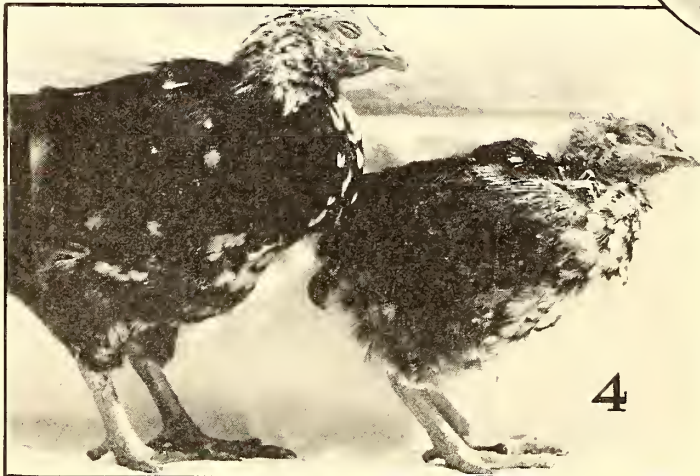
### Roup May Be Infectious Catarrh

Roup presents similar symptoms and is usually associated with chicken pox, sore eyes, and canker of the mouth. It most often attacks young birds because they are more susceptible and then too, they have never had the contagion and have not gained immunity in that manner.

At first there may be a small amount of thin fluid of an offensive odor peculiar



1. Note the small lumps on comb, face and wattles of this cockerel; it is a case of chicken pox or sorehead.
2. Roof of mouth showing at A a canker or diphtheric area; at B is shown the slit in the roof of the mouth. This is the posterior nose opening.
3. Young turkey with an aggravated case of chicken pox called contagious epithelioma; also has sore eyes.
4. This shows two chicks with sore eyes and swollen faces. This is catching.



to this disease. Later the discharge becomes thicker. Such birds should be immediately removed from the balance of the flock and given water, mash, grain and green feed, and should have the nose passage syringed out morning and evening.

Often we are able to stop a disease in a flock by acting promptly and removing the sick birds. Whenever there is a contagion of the air passage and there is likely to be matter coughed up or the birds are likely to have a discharge from the nose, an antiseptic should be placed in the drinking water. A solution of one-third teaspoonful of permanganate of potash in each gallon of drinking water is helpful. The permanganate will not be absorbed and cure the disease, but it will act as an antiseptic, and should a sick bird deposit infection in the water

but is the same germ that causes chicken pox or sorehead and diphtheric sore eyes.

A diphtheria is a disease that destroys tissue and in this case there is shown at A a cheesy mass which is the pus and coagula which have been thrown out on the surface as a result of the inflammation of the roof of the mouth. Sometimes this material accumulates all over the mouth and may eat deep into the tissues and even destroy the bony structure.

To treat such cases attention should be given once a day. Some caustic, as lunar caustic or finely pulverized permanganate of potash, may be powdered onto the sore after first scraping off the cheesy material; or the sore can be swabbed once a day with pure iodine. Make a swab by twisting a small piece of cotton around the small end of a stick and dip it into the pure iodine and it is ready to rub or swab the part. Pure iodine is sometimes injected through the nose cavity where persistent roup occurs.

### Infectious Sore Eyes

This condition is shown in Figure 4. Sore eyes and swollen face sometimes



occur in a single case. Such a condition is contagious and the cases should immediately be removed from the flock and the swollen face painted with iodine or some of the preparations used which consist of mentholated essential oils. In the eyes that are inflamed and in which there is pus, there should be injected one or more drops of a 10% solution of argyrol morning and night. Before this is done the eyelids should be pressed open and the white clot-like material removed. For this purpose a swab as described above will be found useful. Figure 3 also shows a young turkey with a case of infective sore eyes. The eyes are closed and the pus has accumulated till the eye bulges out—a common sight in the poultry yard.

#### Chicken Pox Also Called Sore Head

In Figure 1 there is shown a case of chicken pox in a Rhode Island Red cockerel. This disease is also called sore-head because at first these small hard lumps appear and after a while the top becomes sore and hence "sorehead." All young chickens are susceptible to this disease and when, in the fall of the year, the weather conditions are right the disease will develop if the infection is present.

Just how these germs are carried over from one season to another and how they are transmitted has only partially been discovered. It is quite probable that chronic carriers play a great part. We know that this is the case especially with catarrh or roup. A bird does not entirely recover, may appear somewhat unthrifty, may have a pale face, comb and wattles, may or may not be in lay, may spend quite a lot of time on the perch poles and may occasionally be seen to sneeze. Such a bird distributes contagion and when the climatic conditions are right and birds susceptible to the disease are present, they will develop it.

The same applies with chickenpox. Often by promptly isolating the first birds showing the disease the trouble can be checked. The head and other parts affected should be greased with some of the preparations prepared for this purpose, or the parts may be rubbed with carbolated vaseline or may be painted with pure iodine.

(Dr. Kaupp's 4th edition of Poultry Diseases contains 400 pages of disease information. Used all over the world. Every poultryman should have a copy. Order to-day from Poultry Tribune, Mount Morris, Ill. price \$3.00 parcel post prepaid.—Editor.)

#### TEN KEYS TO PRODUCTION

According to Jones, high egg production may be compared to a lock which requires ten keys all inserted at the same time to unlock it. These ten keys are:

- (1) Choose stock that has been bred for high production.
- (2) Keep at least 75 per cent pullets, and better, all pullets.
- (3) Hatch early; have pullets in full production by November 1.
- (4) Have pullets in good flesh when they start laying.
- (5) Provide warm, light, well ventilated houses.
- (6) Use artificial light to increase food consumption.
- (7) Feed a well balanced laying ration.
- (8) Feed for continued, not abnormal production.
- (9) Watch production every day of the year.
- (10) Correct conditions at once when a drop in production occurs.

#### TWO COCKERELS INCREASE PROFITS \$95

At the Kentucky Experiment Station, fifteen hens were bred to a cockerel whose dam produced 262 eggs in one year. These hens laid an average of 128 eggs during their previous laying year. Sixty pullets saved from this mating produced an average of 152 eggs per year. These pullets were mated with a cockerel from a 263 egg hen. As a result of this mating a group of pullets were produced that averaged 183 eggs each. This is an increase of 55 eggs per hen above the original flock in two years.

Sixty hens of the original type laid 7,680 eggs, worth \$192.00. Sixty pullets from these hens and by the first pedigreed cockerel laid 9,130 eggs worth \$227.52. The next cross produced 60 pullets that laid 10,980 eggs, worth \$283.24. In other words, the two cockerels brought a total increase of \$95.16 in net profits.

This splendid example of the value of pedigreed cockerels should encourage every poultry breeder to purchase male birds that are not only true to type and color but that come from high producing hens. The prospective purchaser of cockerels should not expect to buy such cockerels for a "song."

In view of the fact that good cockerels can be purchased at a reasonable price there is very little excuse for any flock owner not trying to improve the production of his flock. It is certainly more desirable to have fewer hens with high production than a larger flock with low egg records.

#### HEAVY LAYERS START EARLY

According to the manager of the Vineland International Egg Laying Contest, a strict culling method practised systematically will very likely produce a 200-egg flock average.

In order to demonstrate the value of culling, observations were made at the contest regarding the time the birds went out of production and into a molt. Of those laying during the first two weeks of September (these figures are applicable only to Leghorns), 57 per cent were producers of 200 eggs, 20 per cent producers of between 175 and 200, and the balance, 23 per cent, producers of less than 175 eggs. At that time 86 per cent of all the Leghorns in the contest were laying.

#### Mustn't Start and Stop

The same study was made for the first two weeks in October and by that time 22 per cent of the flock had stopped producing. Of the birds that had stopped laying by this time, 66 per cent were producers of less than 175 eggs, 16 per cent were in the 175 to 200 class, and 18 per cent in the over 200 class. Of the birds that were laying during the October survey, 61 out of every hundred belonged to the better-than-200-eggs group. Another interesting feature of the survey was that of the 338 birds that produced over 200 eggs in the contest only 26 had gone out of production by October first.

On the basis of the Vineland survey, it would be reasonable to assume that if a flock of birds is culled in the fall according to the length of time they have been in production, a pretty high class flock of breeders can be obtained.

#### Cull Early Moulters

Following this principle, all the birds that have stopped production before October first, have gone into a molt and have accumulated considerable pigment, should be culled out because they are not as good as the birds that have

continued with production. It must, of course, be remembered that the molt alone is not sufficient indication of high production ability. The physical characteristics of the bird such as refinement, quality, depth and width of body, and temperament should also be considered but, other things being equal, the bird that stays in production and delays the molt until after October is the better bird.

#### MARK THE LAYERS DAY BY DAY

The wide awake poultry man can have a very enjoyable and interesting time in the poultry house, if he watches his birds closely and makes mental notes of his observations.

When going through the house he can notice by their actions which hens are laying. He can also see which hens are about to come into production, and which have just quit production. There will be birds which are always the first ones to greet him when he comes in with the feed bucket, and there will be other birds which insist upon staying on the roost, or in the farthest corner of the room.

#### Select by Appearance

All these actions, when carefully noted, can be made to serve in culling out for production and in selecting the breeders for the coming season. It is time now to be thinking of mating up the breeding stock, and early observations in the poultry house will help considerably in selecting a real good bunch of birds for next spring.

The birds which are not sitting on the roosts, which are singing at all times, and which will run to the feeder will make good breeders provided, of course, they show standard qualifications and good body size. On the other hand, the birds that are always trying to get back into the corner or are on the roosts and will not feed until the feeder has left the pen are not desirable for breeding stock and should not be selected.

#### MARK EVERY PULLET

The progressive poultrymen marks every pullet so that he may become more familiar with the individual characteristics of the flock members. First of all, every pullet coming into the laying house this fall should bear a colored celluloid leg band indicating her age. A definite series of colors can be used to designate the age of birds, such as green for 1926, yellow for 1927, black for 1928, etc.

When trapnesting is done, it is of course necessary to use numbered leg bands. Then each pullet carries a number, and her egg production record is kept under her number on the trapnest sheet. A record can also be kept of her health and the number of times she goes broody and of her performance in the laying quarters. Many poultrymen who are interested only in flock averages, band all of their pullets so that they may record periods of production, sickness, etc., in order to ascertain most effectively which birds are best fitted for the next year's breeding pen.

#### GET MILK SOMEHOW

"Those who have plenty of grain but no milk had better buy a good commercial chick starting feed with milk, or buy powdered milk in some form and mix it with the mash," declares A. J. Chadwell, Extension Poultry Specialist, University of Tennessee.

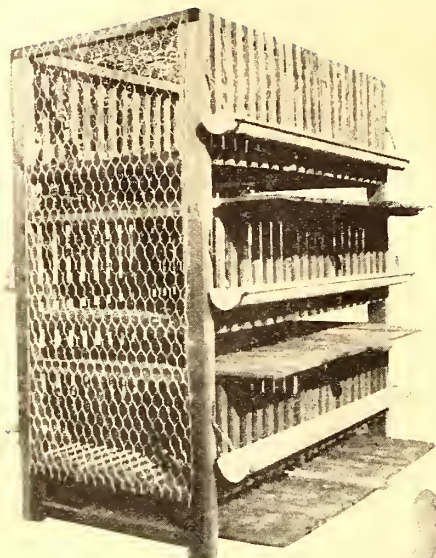


# BETTER MARKETING

## Increases Poultry Profits

—By L. M. Klevay

**M**ARKETING poultry products is not a seasonal job; it is an ever present problem. Eggs are produced at all times, while market poultry becomes available at intervals. It is mainly a by-product of the egg industry except in the rapidly developing broiler plants. Broilers are the most economical to produce and should be marketed as soon as the trade accepts them. Squab broilers weighing one to one and one-half pounds bring a good price but the demand is limited. Broilers weighing one and one-half to two and one-half pounds also bring a good price and the demand is plentiful for hotel and restaurant trade. Cockerels weighing over two and one-half and under four pounds are classed as Springs. When they reach the market, prices have usually slumped and the additional weight barely compensates for the drop in price. Roasters are birds weighing around five pounds. If they show spur development they are classed as stags and are cut in price. Fowls are cull hens sold either in the fall or in the spring. They are classified, light, medium, or heavy according to their weight. The price for fowls is usually best in early spring. This makes spring culling profitable. The price of old roosters usually follows the price of fowls. Capons command a good price on special markets. When such a market is easily reached caponizing is profitable.



Crate fatten when you sell dressed poultry direct to consumer or to hotels and restaurants; but not when marketing through any other channel.

### Fattening Rations

#### Ration No. 1

Ground Corn .....	60 lbs.
Flour Middlings .....	40 lbs.
Salt .....	1 lb.

#### Ration No. 2

Ground Corn .....	100 lbs.
Standard Middlings .....	100 lbs.
Sifted Ground Oats .....	100 lbs.
Salt .....	3 lbs.

Mix with skimmilk or buttermilk to a consistency that will pour easily. Feed in trough three times a day for 20 to 30 minutes. Clean troughs each time. Feed broilers 10 to 14 days, older birds 7 to 10 days.

Starve 12 hours before killing to empty crop. Starve birds for 12 hours before beginning to fatten.

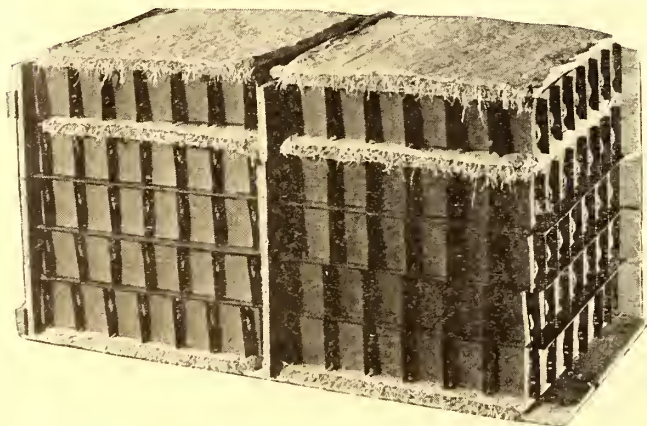
### Develop Direct Trade

—if you can supply regularly choice quality eggs or dressed poultry for:

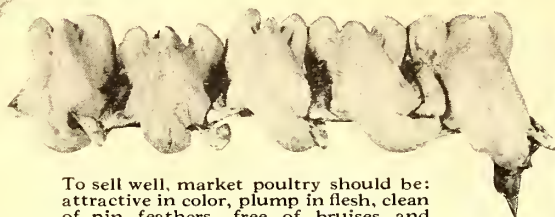
1. Private homes
2. Hotels and restaurants
3. Resorts
4. Tourists trade

### To Reduce Breakage in Transit

1. Use good 30 dozen cases
2. Fill cases
3. Use excelsior pads



This is the standard 30 dozen egg case most used in marketing eggs. Six excelsior pads are usually used as illustrated. In order to get the full cushion effect of the pads, no flats are used between them and the fillers. Cases should be used to stand handling and clean to make a good "first impression."



To sell well, market poultry should be: attractive in color, plump in flesh, clean of pin feathers, free of bruises and skin blotches and uniform in quality.

### Shipping Live Poultry

It is always a good plan to ship only one class of poultry in each coop because a uniform lot always creates a better impression and brings a higher price. Putting only birds of the same age and same size in a coop also reduces casualties in transit so no one bird is heavy enough to trample over and kill others. Very often older birds shipped with younger ones pick and mark up the weaker birds, reducing their value if not killing them.

Avoid losses in shipping live birds. Use standard shipping coops 2x3x1 feet and load according to size of birds.

1 to 2 lbs.....	20 birds
2 to 3 lbs.....	18 birds
3 to 4 lbs.....	16 birds
4 to 5 lbs.....	14 birds
5 to 7 lbs.....	10 birds
7 to 10 lbs.....	8 birds

In warm weather it is a good policy to load fewer birds than the chart calls for.

### Putting Eggs on the Market

The classification of egg grades is not as standard as that of market poultry. Each market seems to name its own standard, but whether it be firsts, extra firsts or extras, better quality receives a premium. All the markets agree that one dozen eggs must weigh 24 ounces to be standard. Smaller eggs are usually penalized by a cut in price.

**PACKING EGGS**—The standard method of packing eggs is in thirty dozen cases. By far the greatest share of all eggs produced reach the market in this way.

Eggs are often marketed in one dozen size paper cartons. This method serves well where eggs are retailed over the counter. The cartons are decorated and usually bear the name of the producer. The cartons are usually made to fit thirty dozen cases making it easy to haul the eggs to the grocer or butcher where they are to be sold to the consumer.

When eggs are shipped direct to the customer by parcel post the one dozen carton is used inside of a corrugated cardboard box. This method has been found efficient in reducing breakage. Parcel post marketing is expensive and the producer must get a generous premium over prevailing market prices to make it profitable.

### Improve the Quality of Eggs

1. Keep no males.
2. Keep the litter and nests clean.
3. Keep eggs in dry, cool, well ventilated place.
4. Don't wash eggs.
5. Gather twice daily or more often, sell frequently.
6. Grade eggs according to size.
7. Don't market small or dirty eggs.
8. Candle and pack attractively for private trade.

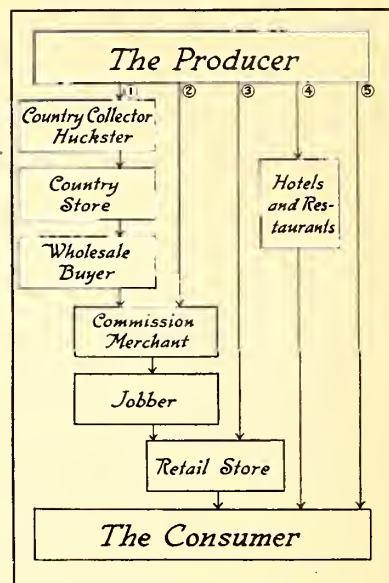


Diagram above shows how eggs and poultry can be marketed. (4) and (5) are outlets for choice quality at fancy prices, (3) also demands quality but uses a go-between. On route (2) more people handle the products and the producer realizes less. Route (1) is the "easiest way" out of it and takes a large share of poultry and eggs.



# Light Helps Fill the Egg Basket

Longer working hours enable the birds to eat more feed, consequently lay more eggs—Either electric or gas lantern light satisfactory—Equipment quickly paid for out of added profits.

By L. M. Klevay

**Y**OUR hens are willing to lay more eggs. Will you turn on the light in the hen house so they can see their way to higher production?

Lighting the laying house is no longer an experiment, nor is it a fad. Hundreds of farmers are increasing their poultry profits by using light, and they have proof of their success.

In an experiment, which the Nebraska Agricultural College conducted, a lighted pen of 90 White Leghorn pullets laid \$35.20 worth more eggs during the winter months than did an equal number of birds without lights. The lighted pen averaged 1060 eggs more for the winter. More eggs, at a time when eggs bring the best prices, mean greater profits. If a flock of less than a hundred can return \$35.20 in one season, a farm flock of 500 birds should be able to pay for the electric lighting equipment in two years. Besides, the family may enjoy the convenience of having electric light in the home while the chickens pay the bill.

Several farm flocks under the direction of the New Jersey Experiment Station returned two dollars more profit per bird when lights were used. With the prevailing egg prices used as a basis of figuring it was found that one egg per bird just about pays for the cost of the current for the season.

## Birds Have More Time to Eat

The use of light lengthens the working day of the birds and results in more eggs from the flock. Recent experiments by the United States Department of Agriculture show that the length of day is an all important factor in the development of the sexual organs of plants. They have proved, by the use of light and light proof dark rooms, that, if the length of the day is controlled, the character of the growth can be controlled as well.

No such perfectly controlled experiments have been conducted with poultry, as yet, but, if it were possible to put the hens to roost at definitely controlled time by the use of dark rooms, the results would undoubtedly prove that a long day means more eggs. It must be remembered, however, that there is a limit to the length of day, and that an overly long day is far more dangerous to profits than a short day.

The experiments with plants proved that the longer day gave the plants a chance to take up more food with the help of light, and turn that food into growth. What is true of plants is true of chickens. Light gives the birds a chance

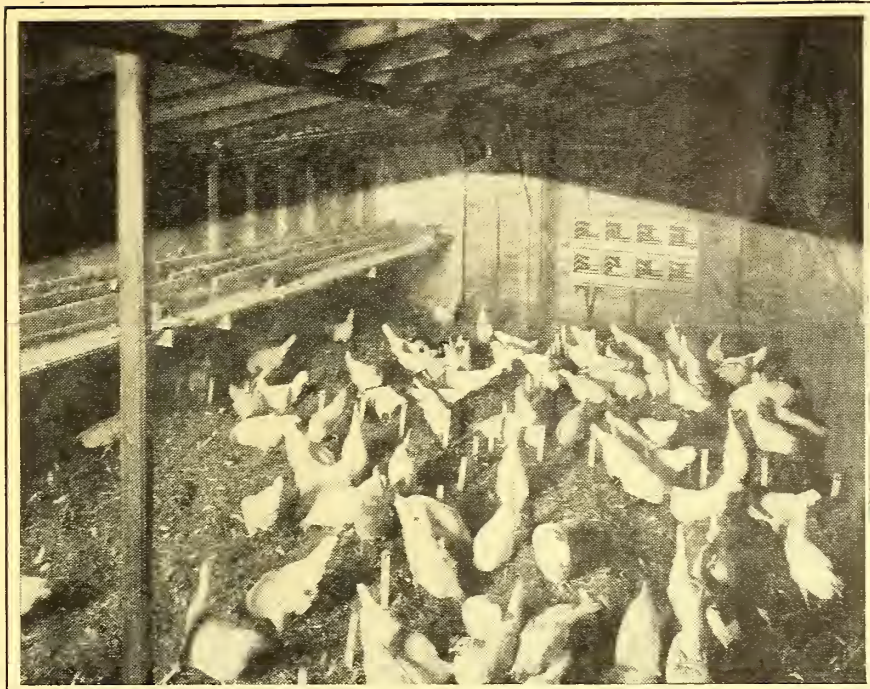


Photo Courtesy Cornell University

to eat more food and to turn that food into more eggs.

There is one difference. While the plants can take up the additional food by themselves from the soil, the chickens must be provided with food each day. That, then, is the big job of the poultryman who lights his laying house.

## How to Use the Lights

There are two systems of lighting the layers, morning light and evening lunch. Sometimes a combination of the two is used, but it makes the job more complicated without adding any real advantages.

The morning system seems to be the favorite. The lights are turned on about four or half past four in the morning and are kept on until natural daylight comes.

The hens then have about twelve hours until dusk.

It is not advisable to make the working day longer than about twelve hours because of the danger of over-working the layers. When forced too much with too long a day, the birds will lose weight and will break down before they have really produced all the eggs they are able to.

Lighting should be started gradually, turning the lights on about fifteen minutes earlier each day until they are turned on early enough to make a twelve hour day. In the same way, the amount is gradually reduced in the spring. Lights should be used until about April first, or the time when the natural day is long enough to maintain the average twelve hour working day.

## How to Use Morning Light

When the morning light system is used, the birds are given a heavy feed of grain just before they go to roost in the evening. They then get another feeding of grain when the lights go on in the morning. The morning feed of grain can be scattered in the litter, after the birds have gone to roost, to save the operator the trouble of getting up with his chickens at four o'clock in the morning.

Food alone is not enough in the morning—water must also be provided. Where the weather is cold and water freezes overnight, some means of providing water must be devised. When snow is plentiful it may be put in the house at night in a pan, according to Professor J. G. Halpin of the Wisconsin Agricultural College, but water can also be provided easily in a thermos type fountain by filling it with hot water after dark. Some types of heated fountains are also very satisfactory.

The birds must have water when they come off the roost, for about two-thirds of an egg is water. If birds don't have sufficient water they can't make the maximum number of eggs. Some farmers think that the additional profits made by the lighting system even pay for the trouble of getting up in the morning and providing water.

## How to Use Evening Lunch

The evening lunch system of feeding under lights has the advantage of being

## How to Light

**Early Hatched Pullets:**—Prevent molt by turning on lights before molt starts. Feed plenty of grain to maintain body weight. If they molt, lights will hurry them back into production.

**Late Hatched Pullets:**—Give them a twelve hour day as soon as the natural day is shorter. Do not feed too heavily on high protein mash to avoid too rapid sexual maturity. Regulate the grain feed to put on body weight.

**Slow Maturing Pullets:**—Turn on the lights before they come into production. Feed wet mash at noon in addition to mash in hoppers. Watch body growth and weight.

**Early Maturing Pullets:**—These are the best birds in the flock and will eat the most feed. Give them lights so they can eat the food needed for high production. Don't cut down their grain ration far enough to endanger body weight and cause a molt.

**Early Molting Hens:**—Cull them very closely. They can be housed with the slow maturing pullets.

**Late Molting Hens:**—Be careful to change to lights slowly for these birds have been in production since spring. A sudden change will throw them into a molt. If you don't push them too hard, they'll delay molting until after the peak of egg prices.

**Breeding Flock of Hens:**—Allow them to go into molt naturally. Put on lights early in January to bring them into production. Feed for 60 per cent to 65 per cent production. Higher production will lower the vitality of the hens and affect the hatchability of the eggs.



more economical in the use of light, but it entails considerably more personal attention. Under this system, the lights are turned on for one hour at about eight o'clock in the evening. During that time the chickens come off the roosts and feed on the grain put before them. When satisfied they return to the roosts. It takes them but a few nights to learn to go to bed as soon as they are full, but there are times when it becomes necessary to install dimmers on the lights to make them go to roost. The extra feed that they get during this evening feeding period helps to make the nights shorter for them. As the main object of lighting hens is to get more feed into them and make the nights shorter, this system is efficient. The amount of grain fed is the same as in the morning light system, part of it being fed in the morning also.

#### Then You Want Eggs

Experimental data shows that a flock of one hundred birds under lights will consume from 12 to 14 pounds of grain each day. The light breeds will need somewhat less than the heavy breeds. About two thirds of this amount is fed in the evening before they go to roost, the rest can be scattered in the litter after dark for the morning feed. Mash should be in front of the birds at all times so that they can have their fill any time they feel hungry. The grain takes care of the body heat and weight while the mash contains the egg producing elements.

A good commercial mash will fill all the requirements of the flock, but for those who are in a position to mix their own mash the following mixture is satisfactory:

100 pounds ground yellow corn; 100 pounds ground oats; 100 pounds wheat bran; 100 pounds wheat middlings and 100 pounds meat scraps or meat meal. This ration may be modified to suit local conditions.

Where milk in any form is easily and cheaply obtained, it can replace part of the meat scraps. When the birds are closely confined it is advisable to put some ground alfalfa hay, up to five per cent, into the mash.

On general farms where alfalfa hay is fed to stock, some of it can be put in racks in the hen house. The hens will eat off the leaves. This food is important because it furnishes the vitamin which aids in the assimilation of minerals and is ordinarily supplied by direct sunlight.

If a commercial scratch mixture is not used, the grain mixture fed under lights should be equal parts of yellow corn and wheat. When wheat is high in price half of it can be replaced by oats making a mixture of fifty pounds of corn, twenty-five of wheat and twenty-five of oats. It is also very important that the birds have plenty of lime rock grit or oyster shell before them at all times.

Green feeds are also very important to the layers. They can be supplied to them in the form of cabbages, mangels or sprouted oats. They are advisable even though the birds are getting some alfalfa hay. Greens furnish succulence and aid in digestion, in addition to what food and vitamins they furnish.

#### Gas Lantern Good Substitute

Electric lights are the most effective, the most convenient, and, in most cases, the most economical. Gasoline or kerosene lanterns are also used effectively, but they take more labor and there is a little fire risk. Of the three, the ordinary kerosene lantern is the least effective, as it does not throw enough light.

#### Automatic Switch Necessary

If electric lights are used, they can be turned on in the morning by an automatic time clock. There are many good clocks on the market (especially adapted to poultrymen's needs). A good time switch can be made at home from an alarm clock. The alarm is set for the desired time and a string is fastened to the alarm key. When the alarm rings and the key turns, it winds up the string and exerts a pull. This pull can be used to make the contact to turn on the lights.

#### Hang Lights Just Right

When electric lights are used they should be suspended from the ceiling and should be six feet from the floor according

### —with Lights

*Feed more grain*

*Have water available always*

*Turn on same time each day*

*Give the hen 12 hours' rest*

*Light both roosts and floor*

*Use two 40-watt bulbs in 20x20 house*

*Check weight of birds occasionally*

*Have grain in litter when lights come on*

*Use them from October to April*

*Have mash in self feeder*

to experiments conducted at the Poultry Department of Cornell University. This insures against breakage by birds flying up against the lights or by being bumped by the attendant.

In the same experiments it was found that one forty-watt Mazda lamp with a cone shaped reflector sixteen inches in diameter, will light about two hundred square feet of floor space well enough to allow the birds to feed with ease. If the house is larger more light will be needed. *To find out the number of lights needed, find the area of the house and divide that number by 200. The nearest whole number will give the number of lights needed.*

The bulbs should be so spaced that their light overlaps a little. That will do away with a dark area between the two lights. The floor however is not the only place that should be lighted. Care should be taken in spacing the lights that some of the rays reach the roosts also. It is important to throw some light on the roosts, because if too dark the birds will not come down to eat.

#### CONSIDER THE OLD HEN

"At this time of year with some pullets already being brought in off the range and the old hens going into a molt, it's always a question as to how many of the old hens should be carried over," declares C. E. Lee, Head, Department of Poultry Husbandry, State Institute of Applied Agriculture, Farmingdale, L. I., N. Y.

"Many commercial poultrymen," Mr. Lee continues, "now follow the practice of hatching in January or February, getting high production from the pullets through summer and early fall, and then carrying these birds through a molt and a resting period of about a month, after which they are used for breeding. These birds are discarded at the end of their

first laying year, or after about eighteen months of egg production."

"Such a plan," maintains Mr. Lee, "does not have the advantage of securing the highest possible egg production from each female within the above length of time. Such birds used as breeders are in the prime of life and vigor. They may also lay a good sized egg after going through the molt which is important for hatching."

Such a plan prohibits long time constructive breeding, for trapnesting and pedigreeing is not worth while when birds are discarded at the end of their first laying year. It also makes necessary a complete replacement of the laying flock each year, and thus increases the amount of hatching, brooding and rearing to be done, and therefore, the area of land needed.

Mr. Lee is intensely interested in this problem because of the opportunities that it offers to breed for a steady longevity. "Many birds are bred from," he says, "which later die and which would not be used at all if breeders were selected when two years old instead of one. Thus, longevity coupled with high egg production is given practically no consideration."

The problem of depreciation is also worth considering. Leghorn pullets worth \$2.50 to \$3.00 as mature pullets, are usually worth about 75 cents to \$1.00 as meat, in many sections of the country at the end of their first laying year. The poultrymen then takes this depreciation at the end of the first year, and keeps these birds over to the second year, even just for laying. They will show a little increase in meat value the second year, and with proper management will show only slightly higher mortality than pullets and also lay only about one or two dozen less eggs than pullets. The eggs are also larger, and therefore, bring a higher average price than eggs from the pullet.

#### PREVENT SOFT SHELLED EGGS

Probably one of the most annoying things in the poultry business is the frequent laying of soft shelled eggs by a group of hens, or even only one hen. It is a sign that something is unprofitably and radically wrong with the hens—something that should be righted immediately. And as for the eggs themselves, they are perfectly useless and merely represent a loss in good food.

In nine cases out of ten, a hen lays soft shelled eggs because there is a lack of calcium carbonate in her diet. This mineral is really pure eggshell material. Therefore, its absence from the diet results in either thin shelled eggs or eggs with no shell at all. Of course, calcium carbonate is generally present in the food and water given to the hen, but there is seldom enough to satisfy her needs.

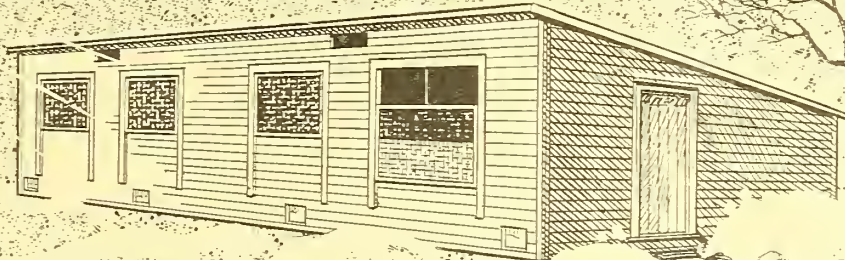
The best and only way to make sure that one's hens are obtaining sufficient calcium carbonate is to keep crushed oyster shell before them all the time. If the hens have been laying soft shelled eggs, it will correct this condition and result in marketable eggs with thick, tough shells. If the hens have been producing only a normal number of eggs, it will profitably increase the egg yield—about 30 eggs is the average annual increase per hen.

By the way, the fact that no soft shelled eggs have been perceived is NOT a guarantee that one's hens have not been laying them. They may have been eaten by hens before discovered.



# Sunshine Makes Winter Eggs

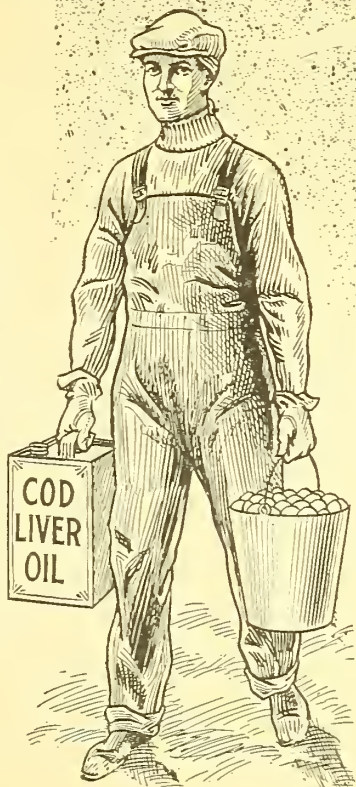
*How to use it if it shines—what substitutes are good*



Sunshine is absolutely necessary in the winter poultry house. It makes the difference between small winter egg production and big spring egg production. If you provide spring conditions this winter you'll get spring production.

But the sun mustn't shine through window glass. Glass filters out the helpful rays. You can get it in four ways: through open windows, when it shines and there is no draft; through a glass substitute used instead of window glass to conserve heat and avoid draft; artificially produced by the quartz mercury vapor lamp as ultra-violet light; or as canned sunshine in the form of cod liver oil.

It will pay you to provide it as this article describes.



violet lamp and cod liver oil. The lamp is the surest source of the healthful light, but, as yet, it does not appear as practical and economical a source as cod liver oil. Some farmers, however, are using it and are very well satisfied.

You may wonder how this information was obtained. Hard work produced it. Years of research brought it to light. The changing practice of brooding baby chicks earlier each year, when they needed to be confined to the brooder house for weeks, focused our attention on the problem. The answer to the problem formed a clue for the latter discovery that vitamin D, the healthful property, would also guarantee bigger winter egg production.

knew that the sunshine supplied the missing link, if the sun does not shine, growing chicks outdoors get no help. With the discovery that the ultra-violet lamp produces the missing link also, a further important step was taken in the right direction.

#### Cod Liver Oil Gave Same Result

Before long the investigators also learned that cod liver oil supplies the same property, called vitamin D, or the antirachitic factor. With this discovery, brooding of chicks in the early spring months indoors became an established business, because the missing link had been uncovered.

#### Also Works on Layers

When Professor J. G. Halpin, head of the poultry department, and Professor E. B. Hart, head of agricultural chemistry at the University of Wisconsin, had uncovered this information, they were led to believe that something similar might apply to laying hens confined in the poultry house during the winter months in the absence of direct sunlight. Accordingly, four groups of carefully selected White Leghorn hens which had one year of laying records completed were chosen.

These groups were as nearly uniform as it was possible to secure, and they were housed in similar pens in the attic of the poultry building, and placed on identical rations. Great care was taken to have the groups as nearly alike as possible, both from the standpoint of history and breeding, as well as from the standpoint of environment. They were given ordinary electric light during the day, but none was provided at night.

The first group was given a daily bath of ten minutes of ultra-violet light, the second was treated exactly like the first except that it did not receive ultra-violet light treatment. The third group was given an allowance of five per cent of dried pork liver in addition to the rations, there being no change otherwise from group two. Group four was given the same ration as group one and two, but the male bird was irradiated (lighted with mercury lamp) for ten minutes daily. This was done to determine if irradiating the male would have any influence upon either egg production or the hatchability of the eggs produced.

The result of this work showed that

#### Started with Baby Chicks

The original chick experiment is interesting. It was started about 1920, at the Wisconsin and Kansas Agricultural Colleges and solved the problem of leg weakness in young chicks hatched early and brooded in confinement inside a poultry house. After checking the problem from various angles and giving up the idea that the contact with the ground was a vital factor, the poultrymen were led to believe that direct sunshine supplied the missing link. Other experimental work proved conclusively that the difference between health and vitality in chicks is a direct result of the rays of the sun shining on the chicks' backs.

A little further investigation of this demonstrated that the quartz mercury vapor lamp producing ultra-violet rays provides a sunshine substitute, and that little chicks grown indoors, when given five or ten minutes of ultra-violet light daily as produced by the quartz mercury vapor lamp, will grow almost as well as chicks in direct sunshine. Investigators were led to make this experiment because they faced the fact that often the sun does not shine during the early winter months; therefore, even though they

**Y**OUR hens need sunshine to complete their winter ration. It is more important than any single feed. It provides the electric spark that converts feed into eggs.

There are four ways of supplying sunshine to your winter layers: let the sunshine in through glass substitutes or open windows; feed the birds cod liver oil; or supply artificial sunshine produced by the ultra-violet lamp. You must furnish sunshine in one of these forms, if you want increased winter egg production, stronger egg shells, no egg paralysis (inability to lay the egg), better hatchability of hatching eggs, and more healthful eggs to eat.

You may think that the sunshine passing through ordinary window glass is just as valuable. It isn't. The window glass filters out the ultra-violet or health rays. Sunshine must enter the poultry house through an open window or a glass substitute, if it is to retain this healthful property.

And, of course, when the sun doesn't shine, or shines very little, you can't expect to get very much of this healthful property from it. You must use a substitute. The two substitutes are the ultra-

By

**O. A. Hanke**



during the five months, from February to June, inclusive, the first group which was exposed to the ultra-violet light for ten minutes daily, produced 902 eggs.

Group two which was treated like group one in all respects except that it did not receive the ultra-violet treatment produced only 252 eggs in the same period of time. Group one laid over three and one-half times as many eggs as group two, and the only difference in the treatment of these two groups was the fact that the first group received ten minutes of ultra-violet light daily.

Groups three and four had an egg production record almost exactly like group two, which indicated that the addition of the dried pork liver to an already satisfactory ration makes no difference in the egg production, and that the irradiation of the male likewise did not affect it. The eggs of the non-irradiated (not lighted) birds were often soft shelled and would collapse when they were removed from the nest.

Group two made the best egg record during the first month of the trial but the production gradually decreased until the fifth month when they laid only a little over one-third as many eggs as during the first month. The group receiving ultra-violet light, on the other hand, made its best production record in the third month of the trial, and while the last month, June, was also the lowest month in production, it was only about 11 per cent under the first month.

#### More D, More Chicks

While the investigators at the University of Wisconsin were checking the differences in egg production, they were also hatching eggs from both groups and determining the difference in hatchability. They found that the addition of ultra-violet light definitely improved the hatchability of the eggs from group one so that 60 to 70 per cent of the eggs were hatchable.

All other groups were exceedingly low in hatchability from the very beginning of the trial and they gradually receded to the zero point. In the last month of the experiment, it was impossible to produce a single chick from any of the eggs produced by any of the non-irradiated birds. The irradiation of the male did not influence the hatchability.

"This work," says Prof. Halpin, "compares very closely with the hatching of chicks in the early part of the season. It is well known that eggs produced during the Fall and Winter are commonly low in hatchability. Perhaps 30 or 40 per cent hatchability is not uncommon. These experiments indicate quite clearly that, if the birds are given the proper amount of light from a quartz mercury vapor lamp, the hatchability can readily be maintained at a much higher point than is common in winter produced eggs.

Besides the positive evidence that the ultra-violet lamp commonly known as the quartz mercury vapor lamp, definitely stimulates the production and besides aids in the production of more hatchable eggs, the investigators were led to believe that the eggs would also have a greater food value. If the eggs were capable of producing a better chick, certain properties within them must provide those elements otherwise missing.

#### Such Eggs Better Food

Experiments were therefore conducted to test the vitamin D content of eggs from the lighted hens as compared with those from hens not given ultra-violet light. It is shown in the experiment, points out Professor Halpin, that with

the different flocks of White Leghorns, the eggs produced by those which were exposed to the ultra-violet light for ten minutes daily were much more potent from the standpoint of their calcifying powers (ability to aid in assimilation of mineral matter in the body) than those of the other flock. He estimates that the eggs produced by ultra-violet lighted hens are ten times as valuable from a vitamin D standpoint as those produced from non-lighted hens.

Since the vitamin D content of the egg

## Sunshine

(or its substitute)

### Insures—

*Bigger winter egg production*

*Stronger shelled eggs*

*No egg paralysis*

*Better hatchability*

*Eggs of greater food value*

must be given ultra-violet light as produced by the quartz mercury vapor lamp.

The laying hens, if they are to lay a maximum number of winter eggs, must be provided with some source of vitamin D. Professor Halpin thinks that the windows of the poultry house ought to be so arranged that a maximum amount of vitamin D, or ultra-violet light, can be secured in this manner whenever the sun shines. When the sun does not shine, cod liver oil must be fed to supply the missing quantity.

#### Follow Advice Carefully

Professor Halpin advises that the heavy laying flock be given cod liver oil as soon as it is confined, either in November or December. "If a small amount of cod liver oil is fed continually," he says, "the flock will keep in normal health and there will be no serious decline in egg production or hatchability."

Get as much of the direct sunshine for the laying birds as possible, declare the investigators at the Wisconsin Agricultural College, because it costs nothing. In addition, however, supplement the sunshine with cod liver oil or light produced by the quartz mercury vapor lamp and then one of the most common flock troubles will be solved.

No poultrymen need now complain that he cannot secure winter eggs, provided a balanced ration is given the birds, ventilation is provided, and some provision is made to supply the sunlight factor, other factors being favorable.

If cod liver oil is mixed with the mash at home it should be mixed at the rate recommended by the company from which the oil is purchased. A good grade of either brown or yellow cod liver oil is satisfactory.

Many commercial mashes contain cod liver oil and some contain cod liver meal, both ingredients supplying vitamin D, the sunshine substitute. In feeding these commercial mashes, the manufacturers' directions must be carefully followed.

#### Oil Can Be Mixed With Feed

The question has been raised whether cod liver oil retains its vitamin D property when mixed in commercial mashes

which are often stored six months before feeding.

"From all records," says Professor Hart, "I haven't seen any special loss in vitamin D when the cod liver oil was stored in the feed for several months." Since the ordinary ration contains yellow corn, the supply of vitamin A is safeguarded by it. Vitamin D is relatively stable.

Cod liver oil is also sold in other forms. It is mixed with yeast and sold in powdered form and is also sold commercially mixed with semi-solid butter-milk and condensed skim milk. Many commercial mashes contain cod liver oil.

It is relatively easy to provide your hens with sunshine or its substitute. Your profits depend on following directions.

#### WATCH GREEN FEED SUPPLY

During November there will undoubtedly be enough cabbage left over from the garden to provide the laying flock with green stuff. Recent studies in nutrition show that fat soluble vitamin A is essential in the ration of laying hens to prevent nutritional diseases. Green feed grown in direct sunlight furnishes this essential vitamin. The common sources of green feed during the fall and winter are wheat, oats, barley or rye pasture, also legume hays, cabbage and sprouted oats.

Green feeds not only supply the vitamins essential for heavy winter production, but they also furnish the pigment which gives the egg yolk a rich yellow color. All green feeds contain minerals essential to good digestion. Green feeds contain all the necessary minerals for egg production. Green feeds also serve as a laxative to keep chickens in a good physical condition. They increase palatability and encourage heavy eating for increased weight and heavy production.

Legume hay can be used quite satisfactorily if it is chopped up fine and then placed in a wire feeder from which the birds may eat liberally.

#### HEAVY GRAIN FEEDING NECESSARY

BOTH the pullets and the yearling hens need plenty of grain this fall. It enables them to put on body flesh which they need in the laying pen this winter. It is a proven fact that pullets and yearling hens which go into the winter laying season with good body weight, invariably lay heavier and longer than those which go into the winter laying season in a depleted physical condition.

Corn is an excellent grain feed, and should be fed quite heavily to both the young pullets and the laying hens at this time. A good scratch ration is composed of 50 pounds yellow corn, 25 pounds wheat, 25 pounds oats. Commercial grain mixtures are also very satisfactory.

#### MILK WORTH MORE FED TO CHICKENS

Skimmilk is great pig feed, but the man who feeds the milk to his hens and takes his profit in the form of increased egg yields is the one who makes the most money from his milk, say Iowa State College poultrymen.

It has been found that, when eggs are selling for not less than 30 cents a dozen, skimmilk is worth around \$2 a hundred-weight for good pullets.



# Winter Diseases That May Bother

Laying and nutrition troubles are likely to be worst

By Dr. B. F. Kaupp, Head, North Carolina Poultry Department

EVERY season brings its special diseases to the poultry flocks. This is because climatic conditions vary, and climatic conditions do play a great part in poultry troubles.

In this day when birds are pushed to their fullest capacity, troubles are likely to occur that did not appear when we were raising our birds on the farm, before the days of scientific poultry management was developed and when each hen laid 25 to 100 eggs with an average of 72 eggs per hen per year.

There is a reason which should be thoroughly understood in order to correct or to even prevent such troubles. It is the intention in this article to take up some of those things that will especially affect the pullets in the earlier part of the winter.

## How Egg is Formed

The ovary of the pullet, at first scarcely as large as a half navy bean, gradually

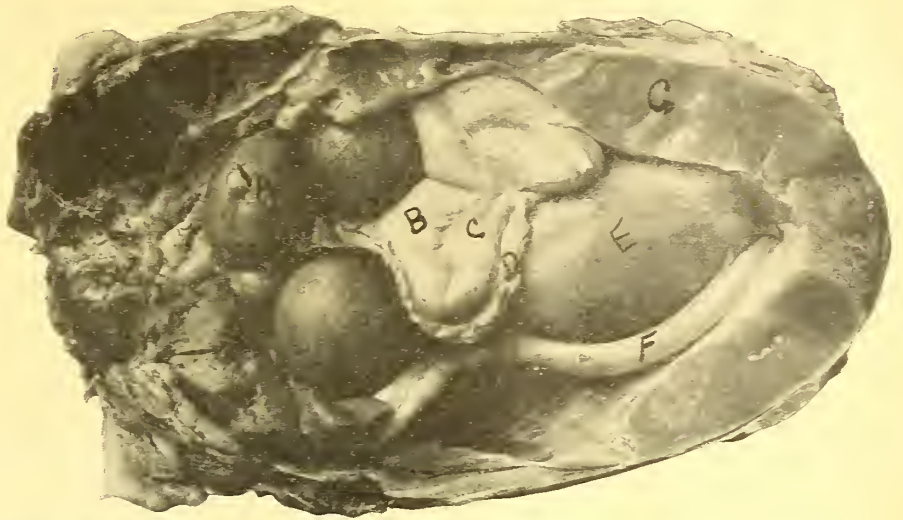


Fig. 1. A cross section of a chicken showing the reproductive organs. A, the yolks forming in the ovary; B, the oviduct; C, the superior and, D, the inferior ligament, that holds the oviduct in position; E, an egg ready to be laid; F, the large intestine; G, the abdominal fat storehouse.



Fig. 2. (at left)—A bad case of prolapse in a pullet. A, a part of the bowel; B, the oviduct inverted and protruding through the anus. Such a bird may be attacked by its mates, and in a few minutes disemboweled.

becomes larger as the pullet comes into lay. In the picture (Fig. 1) there can be seen several yolks in the process of formation, as the yolks are entirely formed in the ovary. This means that if we are pushing the pullets so that they are laying 25 to 30 eggs a month, 10 days before this time one of the 3,500 small single celled ova is beginning to have deposited in it small amounts of egg yolk.

## 10 Days to Form Yolk

It requires about 10 days to form the yolk and another day to manufacture the egg so that if a hen is to lay an egg a day with a skip of only one or two days a month there will be at least 10 to 12 yolks in the process of formation at a time. This is done with wonderful regularity and trip-hammer style.

When the yolk is mature or fully formed there is a line called the stigmal line at which the blood vessels separate. The capsule in which this egg develops ruptures and the yolk falls into the ovarian pocket. The pocket is located just under the ovary. Then the yolk slides on into the beginning of the egg canal which we will hereafter call the oviduct.

## Protein May Give Trouble

If we are pushing our birds at a high pitch, feeding a high animal protein ration, something may go wrong. Then there is a congestion of the small blood

vessels of this capsule. One of the vessels may not separate from this stigmal or cleavage line and the result will be that a drop of blood will ooze out and will appear on the outside of the yolk. The egg when sold will show a spot under the candler, or, when broken out into the frying pan or cup, will show the blood spot.

From a meat inspection standpoint we could not say that this egg is not fit for food but the buying public thinks so and complains that the eggs have blood spots. This is hard to eliminate except by candling, or if we are trapping the hen having the trouble she can be detected and removed and allowed to rest up by putting her on light grain ration with feed and water.

## Prolapse Likely in Pullets

An eversion of the cloaca and lower portion of the oviduct, in which the parts hang out of the body, is commonly called a prolapse. The second picture (Fig. 2) accompanying this article illustrates this point. This condition may be so severe that the posterior portion of the large intestine or rectum, called the cloaca, is turned inside out.

Among the causes of such a prolapse may be stimulating feeds where the birds are bred generation after generation for very high production, large size eggs, and force feeding so that the pullets come into laying before the body development is sufficient and before the muscles of the part have become strong enough to properly function and keep their normal state.

## Must Consider Protein Nature

It has been thought that too high protein content—20 percent or more—might be the cause, and by cutting down to 18 percent, or if need be to 16 percent, that the trouble would be overcome. However, we have had some reports in these laboratories that indicate this condition has occurred in flocks of pullets in the early winter in which the protein content was not more than 18 percent.

There is another vast difference and that is in the kind of protein. Animal protein is not vegetable protein. If we simply say so much protein we have really

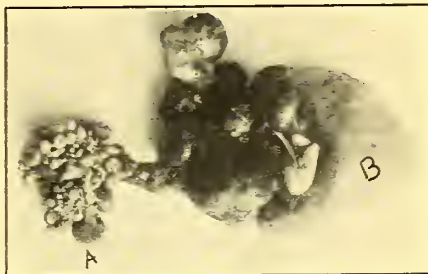


Fig. 3. A blood tumor which caused the ovary to stop forming yolks. A, the ovary; B, the blood tumor.

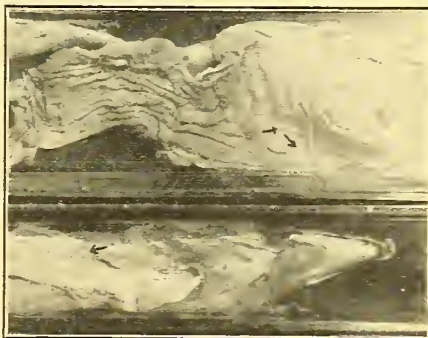


Fig. 4. This is the lining of the esophagus. On it can be seen small round cheesy lumps (see arrows) which indicate that the pullet died of deficiency disease.



said very little. No more than 11 pounds animal protein should be in each 100 pounds laying mash. One must be careful about making radical changes or the birds at this time of the year may go out of production and into a neck molt. Whatever alteration is made in the feeding program must be made gradual and with caution.

#### 24 Hours for White and Shell

After the yolk is formed it requires about 24 hours for the balance of the egg to be constructed in its passage through 24 inches of egg canal which is doubled into three folds and lodged in the abdominal cavity just back of the ovary. There may be an egg stoppage due to a lack of secretion to lubricate the egg, or the egg may be too large for the pullet, or there may be constrictions due to disease processes.

Aggravated constipation is also given as a cause as well as large eggs causing considerable straining. Prolapsus may also be caused where there is an inflammation of the lining of the oviduct causing violent straining. If the ovary is active, and there is an egg a day developing in the oviduct this so increases the bulk when taken together with the engorged intestine that it may produce a condition which predisposes toward eversion.

#### Prolapsus Symptoms Described

The afflicted hen will be noted to strain occasionally as though she were trying to expel an egg. The vent fluff is moist and the mucous membrane protrudes through the anus and appears red. If this condition is not treated at once, and the mucous membrane is allowed to protrude, even if the bird is not attacked by its mate the protruding part soon becomes inflamed from exposure to the air and infection may take place. Later, the parts may become ulcerated as a result of mechanical injuries or attack by germs. There is also a tendency for other birds of the flock to pick at the protruding part, and this sometimes results in death of the bird.

#### What to Do for Affected Birds

Immediately remove an affected bird from the flock. Feed only grain, green feed and water. Wash the protruding part with warm water in which has been dissolved enough permanganate of potash to make the water a deep red color. If the parts are much congested and swollen, hot applications of water in which there has been placed one-half teaspoonful of tincture belladonna to the tea cup of hot water should be used.

After the parts are thoroughly cleansed, gently replace the protruding part. The bird should be looked after twice a day and given whatever attention is needed. There is only one way of curing such a bird and that is by giving her rest so that no more eggs will be formed. This will give the parts a chance to heal and the muscles to become strong again so that the parts will be pulled back into place after laying each egg.

#### Ovary Troubles Lessen Production

There are many ovarian troubles that will throw birds out of laying. One of these is a hemorrhage in the ovary or in a capsule in which a yolk is developing. One such case is shown in picture (Fig. 3) and is called a hematoma or blood tumor. We have seen these blood tumors as large as a base ball.

If the feed is not a well balanced one, that is, does not contain proper minerals

and especially proper vital elements in the proper amounts, the birds may lower in production, become light in weight and some of them die. Whenever an unusual death rate occurs it is well to look for the trouble, and if you cannot find the trouble and do not know the line to pursue, help should be solicited from your state agricultural college.

#### Eye Troubles from Various Causes

All eye troubles that occur in the early winter are not rous by any means. Some of them may be due to infection, others to injury, and still others, especially the kind in which there appears to be no inflammation (redness) but a cheesy accumulation in the corner of the eye, caused by a deficiency disease. We mean a lack of ample amounts of fat soluble A which we rely on our seven pounds of green feed per 100 birds per day to supply, or substitutes to furnish it in the form of cod liver oil or dried orange pulp. In picture No. 4 there are small round cheesy lumps which are about the size of a millet seed and are located in the mouths of the glands. These indicate lack of vitamin A. Be sure to supply cod liver oil if your birds show this trouble.

(Dr. Kaupp's 4th edition of Poultry Diseases is just off press. It contains 400 pages of disease information you have been wanting to know. Order from Poultry Tribune, Mount Morris, Ill., price \$3.00, parcel post prepaid.—Editor.)

#### PAYS TO FEED 20 PER CENT MEAT SCRAP

In order to determine the best proportion of meat scraps in the mash for laying hens, the poultry department of the University of Kentucky conducted a series of experiments in which four pens of birds were fed five, ten, fifteen and twenty per cent meat scraps. The experiment was run three successive years and proved conclusively that it pays to feed the laying hens well.

The following table shows the cost of

Mash	Cost of Feed Per Hen	No. Dozen Eggs	Cost of Eggs Per Dozen	Value of Eggs Per Hen	Profit Over Feed Cost
5% meat scrap....	\$1.30	9.06	14.3c	\$3.18	\$1.88
10% meat scrap....	1.41	10.45	13.5c	3.76	2.35
15% meat scrap....	1.52	11.10	13.6c	3.94	2.42
20% meat scrap....	1.48	12.12	12.2c	4.38	2.90

feed per hen, the production per hen, cost of eggs per dozen, value of eggs produced, and the profits per hen over feed costs for each of the different rations. The experiment proved that while the 5 per cent meat scrap ration was the cheaper, it produced the fewest eggs, and, therefore, the lowest profits over feed cost. The 18 cents difference in the cost per hen of the five and twenty per cent meat scrap rations produced \$1.02 greater profits over feed costs at the end of the year.

According to the poultry department, the experiment proved that 20 per cent meat scraps in the mash produces both the greatest number of winter eggs and the greatest number of eggs yearly. The number of eggs produced each year was in direct proportion to the amount of meat scraps in the mash. As the percentage of meat scraps in the mash increases, the cost of feeding a hen for one year tends to increase, but at the same time the percentage of meat scraps in the mash is increased, the returns per hen also increases.

#### MRS. NORRIS MAKES \$4 PER HEN A YEAR

A flock of 137 White Plymouth Rocks returns a profit of \$602 a year to Mrs. R. E. Norris of Cass County, Nebraska. She aims to cull for high egg production, although some of her birds have won prizes at poultry shows.

She punches the web of the chickens she raises, the mark being changed for each hatch. When she culls, she sells all two year old hens except those that have shown to be exceptionally good producers. Her experience has shown her that hens are not very good producers after they are two years old.

She has separate breeding pens in which she keeps a few of the best hens in the flock with good males. Every now and then she buys eggs from breeders with high producing flocks, in order to introduce new blood in the flock.

#### Makes Remarkable Record

Her four ordinary chicken houses are not at all different from those that the wives of ordinary farmers have. Her record for the past two years is as follows:

Average number of hens every year.....	137
Total number of eggs.....	39,283
Average number of eggs per hen.....	146.6
Total expenses.....	\$ 186.45
Total income.....	\$1,492.20
Total profit.....	\$1,205.75

This flock is a good proof that it is profitable to keep poultry on the farm, when we take into consideration that housewife has cleared \$1,200 in two years from poultry, and in addition has done all the work in the house.

#### FLESHING MASH KEEPS PULLETS GOING

When pullets start laying as early as September, it is very hard to keep them from going into a partial or complete moult. The moult can be prevented by feeding generously on scratch grain in order to maintain the body weight of the birds. Where a wet mash is being fed, it should be made up mostly of ground corn if the birds show a tendency to lose weight and go into a moult. Rhode Island Red pullets should get about sixteen pounds of scratch grain per hundred per day during the winter months. At that rate, feed 65 birds ten and one-half pounds of scratch feed a day. Feed two-thirds of it in the evening, and one-third in the morning.

Lack of green feed will affect egg production. Plan on supplying sprouted oats to your hens.

Lice will sap the vitality of the birds and will cause a drop in production. They may also be instrumental in making birds lose body weight and go into a moult.

Chickens should be mated ten days or two weeks before eggs are set for hatching. In some exceptional cases, eggs will be found fertile after a much shorter period of mating, but in order to be safe it is best to have the flock mated long enough.

#### Watch Out for Worms

By this time early hatched pullets may be severely infested with worms, too, if they have not been raised on new soil. Better use a reliable commercial worm remedy, and remove this handicap. Tobacco dust mixed in the growing mash at the rate of two pounds of dust to 100 pounds of mash usually keeps the birds free. It is also fed layers at the same rate.



# How to Get December Eggs on the Farm

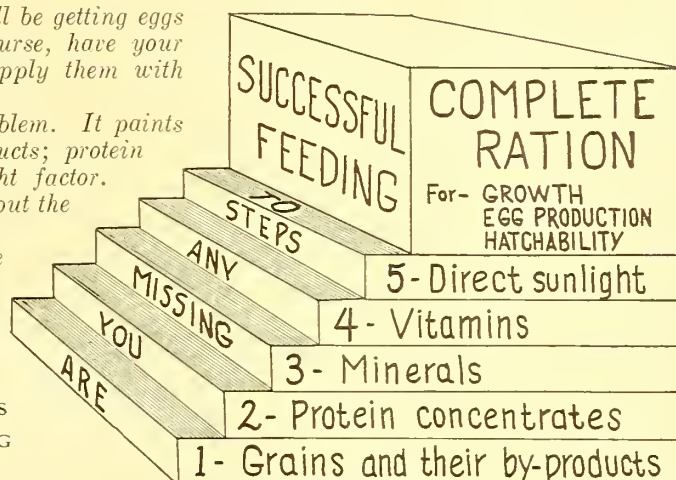
The five-part ration mentioned here will help you

By D. C. Kennard, Ohio State Experiment Station

Follow the directions given in this article and you will be getting eggs this month when prices are high. You must, of course, have your birds in a warm house, free of drafts, and must supply them with plenty of fresh warm water.

This article summarizes the whole winter feeding problem. It paints out that you must provide grains, and their by-products; protein concentrates; minerals; vitamins; and the direct sunlight factor. Read the article now. Then you will agree that it's about the best article on this subject that you have ever seen.

We are glad to be able to present this exclusive article from Dr. D. C. Kennard, who is in charge of poultry investigations at the Ohio Experiment Station.—Editor.



© D. C. KENNARD

**U**P-TO-DATE today but out of date tomorrow—that has been the effect of recent nutrition information, so rapidly becoming available, upon the principles and practices of poultry feeding. Most of our knowledge and progress along this line dates back but a comparatively few years. It constitutes a fascinating story of progress. Briefly related it is as follows:

The balanced ration came first. Grain, seeds and green vegetation with insects was nature's method of serving the jungle fowl's requirements. But finally man learned that the birds made better growth and laid more eggs when additional protein in the form of fresh meat, milk, or the more recent animal packing house by-products were used.

That was the advent of the so-called "balanced ration," which for a number of years was considered as the "last word" in poultry feeding. It was the balanced ration,—a suitable ratio of proteins to carbohydrates and fats,—that first made profitable poultry keeping possible. It was the first real advance in poultry feeding lines and that was only 50 to 60 years ago!

The balanced ration was supposed to be comprised of two parts—grains or seeds, and additional sources of proteins. The complete ration as developed during the last few years is composed of five essential parts:

## Five Parts Make the Complete Ration

1. *Grains and their by-products*, as corn, wheat, oats, barley, middlings and bran.

These comprise 75 per cent or more of the ration, and they are the easiest part of the ration to provide.

The choice and the proportion of the different grains and their by-products in a ration may be varied greatly so as to utilize the grains available, or purchase those which can be secured at most favorable prices. Of the more common grains, rye is the only one which can not be used to advantage. Oats and buckwheat should only be used in limited amounts. Corn, wheat, barley or the kaffir corns can be used extensively in greatly varying proportions.

2. *Protein concentrates*—as skim milk,

## BUILDING STONES OF MODERN POULTRY FEEDING

buttermilk, meat scraps, fish meals and vegetable oil meals.

This part of the ration most often determines the profitable returns from poultry keeping. When grains are properly supplemented with protein, very satisfactory results will usually be secured, if the flock has access to a good outside range.

Suitable sources of protein are readily available at reasonable prices, but often the principal difficulty is the question of false economy. Too many are unwilling to purchase the needed products with the

result that for every twenty-five cents saved they often lose a dollar because of diminished returns.

3. *Minerals*, as supplied by milk, meat scraps (50 to 55 per cent protein) bone meal, salt, oyster shells, ground limestone (90 per cent or more calcium carbonate) or an effective mineral mixture.

The question of minerals has been a confusing one for many, but so far as the practical poultry keeper is concerned it may be regarded as a very simple matter. The usual ration only requires three sources of additional minerals: Bone or its equivalent, salt, and oyster shells or high grade limestone. The amount of bone may vary from two to four per cent of the mash according to the ration. In certain instances when meat scraps and milk are fed liberally, the bone can be entirely omitted. Salt is used at the rate of one-half to one per cent of the mash. Oyster shells are to be kept available in suitable feeders at all times.

## How to Use Vegetable Protein

If a mineral mixture is desired for use with vegetable protein concentrates, as the oil meals when used instead of proteins from animal sources, the following simple mixture developed by the Ohio Experiment Station has proven highly satisfactory in extensive tests and in its use by many poultry keepers. This mixture is composed of bone meal 60, ground limestone (90 per cent or more calcium carbonate) or oyster shells 20, and salt 20. Two to four per cent of the mixture is added to the mash depending upon the nature of the mineral deficiency to be corrected.

Whether there is need for additional iodine, iron, sulphur and the like has not as yet been demonstrated.

4. *Vitamins*, as found in yellow corn green feed or immature cut alfalfa, red clover or soybean hay.

Yellow corn is a valuable source of vitamin A which is often deficient unless green feed or its equivalent, high quality





legume hay, is abundantly supplied. Hence it is important to use yellow corn rather than white corn for winter feeding.

Another source of vitamin A is high quality cod-liver oil which possesses this vitamin in its most concentrated form. Vitamin A, sometimes called the growth factor, also affects the general health of the birds and serves as a preventative of nutritional rump, and colds in general. This is one of the reasons why green feed or high quality legume hay is so important for winter feeding.

Vitamin B is also essential but there is seldom a deficiency since it is usually amply provided by the grains as fed whole or ground in most rations. This vitamin is also abundantly supplied by green feed and milk.

5. *The direct sunlight factor* which promotes growth and prevents leg weakness or rickets as supplied by direct sunlight, cod-liver oil or eggs.

This factor is partially provided by green feed and immature cut legume hay. The effective utilization of direct sunlight constitutes one of the most important factors to be considered in connection with successful feeding and management of chickens. When the flock is confined indoors or for any reason there is a deficiency of this factor, the general health of the flock is seriously affected. This is accompanied by oviduct disorders, paralysis, poor shell texture, and low hatchability of the eggs. Eggs from flocks denied the D (sunlight factor) are impoverished and are inferior for table use, as the D factor is one of the most valuable nutritional properties of the fresh egg.

Direct sunlight is the best source of this vital factor. It is usually the cheapest and most effective means of supplying it, although in some localities the amount of sunlight during the winter months is so variable and uncertain it cannot always be relied upon. In that case it may become necessary to use cod-liver oil in the ration.

#### How to Use Sunlight

Effective utilization of direct sunlight for indoor chickens can be accomplished, if the front of the house is arranged so it can easily be opened to allow the direct sunlight to enter whenever weather conditions will permit. Also an open or closed sun-parlor on the south side of the house is of great value in this respect. The bottom of the sun-parlor can be filled in with 8 or 10 inches of cinders, slag or gravel.

In case of the open parlor it should be protected from the prevailing winds so the birds can bask in the sun with the greatest possible comfort. If the parlor is to be enclosed, a glass substitute which will effectively transmit the beneficial rays of direct sunlight should be used.

In conclusion, the complete ration is the only one that can be expected to succeed. It is composed of five essential parts—a deficiency of any one of these vital parts results in some degree of failure. A ration is comparable to a chain of five links—it can be no stronger than its weakest link.

#### WORM POULTRY TWICE A YEAR

Intestinal parasites in chickens and turkeys are a common thing. It is generally recognized today that the majority of flocks are infested unless they have been wormed. Symptoms of worms are so similar to those of many other poultry troubles that the poultry raiser in many cases does not suspect worms. Experiment Stations have veri-

fied this by numerous tests and have found that more than 50% of the poultry losses can be attributed to these internal parasites.

Worms are present in many flocks that apparently are in the pink of condition, yet upon examination are found to be infested.

The real loss directly and indirectly from worms, of course, cannot be accurately estimated in dollars and cents, but it is large. The worms feed upon the food which has been eaten by the fowls, thus sapping the vitality of the fowls continually. This makes the bird more susceptible to disease and affects the egg production materially. In young stock, development is retarded.

Fortunately, the means of eradicating worms is comparatively easy. Both the government and state authorities recommend Kamala for tapeworms. So far, this is the only remedy that has been found nearly 100% efficient in removing tapeworms and still not harm the birds. Several products have been discovered which are satisfactory for the removal of roundworms, but Nicotine and Santonin are both highly recommended. There are products now being manufactured and advertised which are made up for practical use according to these recommendations.

It behooves the poultryman to watch this condition in his flock. Chicks and baby turkeys from worm-free stock, all other conditions being equal, are sturdier than those from parents whose vitality has been lowered by internal parasites. At the age of 8 to 10 weeks, the young itself should be wormed and every effort should be made to keep them from contaminated ground. This can be accomplished in many cases by plowing and cropping the soil used for range by the stock.

#### IOWA COLLEGE REPORTS ON GLASS SUBSTITUTES

A series of experiments extending from November, 1926, to May, 1927, at the Iowa State College Poultry Department tested the efficiency of window glass and window glass substitutes in the rearing of baby chicks.

Four lots of 20 chicks each were reared to ten weeks of age. Each lot was exposed to the rays of the sun under different window glass substitutes. One lot was exposed under window glass and one under direct sunlight coming through poultry netting to test the efficiency of the substitutes.

During the first test which extended from November, 1926 to February, 1927, the chicks received approximately 64 hours of exposure. In the second test which extended from February 19, to May 14, the average exposure totaled 97 hours. This increase in exposure was due to the change in season which permitted more frequent and more prolonged exposure. On cloudy days when the value of exposure was doubtful, birds were not exposed.

Findings of the experiment indicate that there is a variability in the efficiency of the manufactured substitutes. Such a variability of course, is expected in all manufactured products and is only natural. It was definitely established that the attainment of 12 per cent of the beneficial rays of the sun as measured by the lithophone test was sufficient to prevent leg weakness when a well balanced ration was fed. As the efficiency of the substitutes used varied from four to 30 per cent approximately,

some admitted enough ultra violet rays to prevent leg weakness while others did not.

#### How to Use

Apart from finding the efficiency of the various substitutes the experiments served to bring out the definite recommendations for the proper use of glass substitutes. They follow:

1. Glass substitutes, whenever used, should always be placed in a vertical position.

2. For best results glass substitutes should not be used for openings in roofs or any slanting surface.

3. Glass substitutes used on frames should be securely tacked and firmly braced to prevent whipping.

4. Make all frames removable so they may be stored away from the hot sun and dust during the summer.

5. Glass substitutes admit little if any air, therefore, the house must be ventilated properly to obtain the best results.

6. Glass substitutes should be kept free from dirt and dust.

7. When window glass or glass substitutes are used, *Direct Sunlight* should be admitted whenever possible.

#### WARM HOUSE NEEDS VENTILATION

A warm poultry house that will help to keep egg production high during the winter months must be well ventilated, states Professor E. R. Gross, agricultural engineer at the New Jersey Experiment Station, New Brunswick.

Tight walls, doors, and windows, ventilating flues, which may be constructed of wood, at a low cost, and a limited overhead space are essential to a warm, well-ventilated hen house, Professor Gross asserts. He also advises that the overhead space be reduced to the minimum, and suggests that a straw loft be constructed to accomplish this end. Mr. Gross stresses the point that a warm house must be ventilated in order to remove moisture and foul air during cold weather. If the moisture is not removed from the house, it will condense on the walls and windows and cause disagreeable conditions.

#### SANITATION CONTROLS BACILLARY WHITE DIARRHEA

The best way to control bacillary white diarrhea and coccidiosis is by means of proper and sanitary methods of brooding, declares S. R. Wallis, University of Arkansas, College of Agriculture, Extension Service.

Small, dirty, poorly ventilated, cold, damp houses are costly to poultry raisers, he declares. Home made brooder stoves and other makeshift arrangements for furnishing heat are not satisfactory and will result in unsuccessful attempts and unsatisfactory results in general.

According to S. R. Wallis, a good brooder house fulfills the following qualifications:

Located on ground free from parasite infestation and disease infection; located on well drained porous soil; built large enough to care for desired number of chicks; built to have two rooms, one for the stove to have the desired temperature, and the other to be a cool room where the chicks may get relief from the wilting heat; have plenty of ventilation without having a draft; have either a properly constructed concrete floor or a light wood floor; have a good stove which is easily operated, one not liable to cause fire loss.



# How to Linebreed for More Eggs!

A simple farm breeding program

By C. W. Knox

In charge, breeding operations at Iowa Agricultural College

**C**ONSTRUCTIVE breeding, with an ever increasing capacity for egg production, is the key to poultry profits.

Probably the best form of breeding for the average poultryman is linebreeding. There are several reasons for this. First, by this method the breeder is enabled to procure a uniform progeny. Second, he or she is able to increase the amount of desirable blood lines in the chicks that are secured by this type of directional mating. Third, it does not necessitate the purchase of new breeders every year.

In the old style matings, where a new male is purchased every year, the results in regard to fertility, hatchability, uniformity of size, and egg production vary greatly from year to year.

This is avoided by linebreeding. Although this method is a form of inbreeding, it avoids most of the dangers that come from such close matings, yet retains practically all of the advantages.

## Lady Ames Line Bred

The proof of all this, of course, is in birds developed from this type of mating. "Lady Ames," the first official 300 egg hen in the middle west, is a line bred individual. She was developed at the Iowa State College Experiment Station, and she also made her record there. The highest official individual record hen for the middle west, that laid 322 eggs in 365 days, is a line bred bird and her pedigree is below her picture in next column.

Several things may be learned from her pedigree. First, that she is line bred to male No. 683. Second, that this cock bird was the original foundation male of the Ames flock. Third, he appears as the great grandsire on the dam's side, and as the grandsire on the sire's side.

Does this mean that all one needs to do is to linebreed and soon thereafter obtain 300 egg hens? Not at all; careful



C. W. Knox, who is doing some exceptional breeding work at Ames. Mr. Knox had the average Iowa farmer in mind when he devised this breeding system. It will work on your farm to.

Below is "Lady Ames" whose pedigree is outlined in this article. She laid 305 eggs in 365 days without artificial lights.



## LADY AMES

Pedigree of F 1923 322 eggs in 365 days	Sire Col. D. R 1467	Sire, Col. B No. 683	Dam, 304-310 Pen
		Dam, D769 1st yr., 262 2nd yr., 225	Sire, Dam, 252-287 Pen
	Dam, E 1649 1st yr., 196	Sire, Col. D M302	Sire, 384 Dam, D275 1st year, 244
		Dam, 376 1st yr., 241 2nd yr., 176	Sire, 683 Dam, D760 1st year, 268

and intelligent culling must be practiced.

Hens must be selected according to size, color, and egg production. Much

greater care must be used in purchasing a suitable male as upon him rests the success of your breeding operations. It is well to remember that money spent on a good male will be returned manyfold in years to come.

With this method of breeding, a new male need not be purchased for at least four years. Comparing this with old time breeding operations, if one formerly paid \$2.00 for a male each year he now can afford to pay \$8.00 and if he paid \$5.00 for a male he should get a \$20.00 one, and so on. This is one place it does not pay to skimp.

Skimp on the hens, buildings, equipment, feed or whatnot, but not on your foundation male. Be sure he is of good size, and has good egg producing ancestors, that he is a pedigreed male so that you are better able to select the male you want.

The breeder must guard against decrease of fertility and of size. These are the stumbling blocks of thousands of breeders.

The average breeder with a small flock of one hundred to two hundred hens, upon seeing pedigrees such as that of F1923, will immediately state that such matings involve too much work; that it is necessary to trapnest and keep a complex system of records which would use up all their rainy days, and that such work should be left for the specialists and not for the man who carries 200 head of chickens as a side line.

There is a solution that the busiest farmer can use. Systematic linebreeding rather than accidental mating should be practiced.

## Buy Good Male First

It will be necessary to buy a good foundation male. For example, suppose a breeder could buy a male such as male No. 683. The first year place him in a colony house about 10 x 12 feet with 18 hens, if White Leghorns; 12 to 15 of the heavier hens, according to the season. These hens can be the very best of all the 100 or 200 hens that you have in your flock. Then your crop of pullets and old

## 1928

### Spring Program

The old house mated as in 1927. Colony house, Pen A, with 15 good hens selected from flock, or bought, mated with the pedigree male, No. 683.

## 1929

### Spring Program

The males from the special Pen A are used on the average females in Pen C. Male No. 683 is used again with 15 good females in Pen A.

## 1930

### Spring Program

The females from Pen C are mated with males from Pen A1. This results in a line bred offspring, because the blood of No. 683 is infused both in 1929 and 1930. Male No. 683 is used again with 15 good females in Pen A2.

## 1931

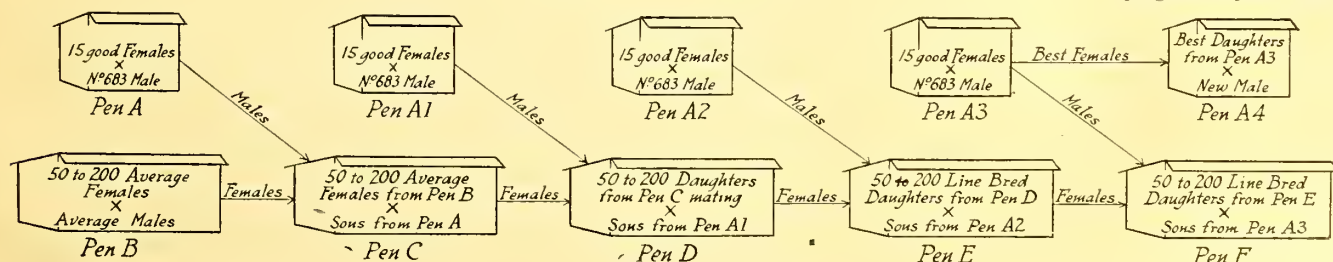
### Spring Program

The female offspring from Pen D are mated to the male offspring from Pen A2, to make up the large flock in Pen E. Pen A3 is the last mating of No. 683 to 15 good females.

## 1932

### Spring Program

Pen F contains female offspring from Pen D and male offspring from Pen A3. Pen A4 is a new mating. Old No. 683 is replaced by a good new male. He is mated to 15 of the best daughters of No. 683 from Pen A3. From here on program repeats itself.





hens can be placed in the flock house, and you can start breeding your birds systematically as shown by the chart.

A pen of 15 hens mated to this high production male should produce about 45 to 50 cockerels good enough to use for breeders. Figuring a 50 per cent production during eight hatching weeks the 15 hens should produce 420 eggs. An average hatch of 60 per cent would give 250 chicks, and a ten per cent brooding mortality would reduce them to 225. Since half of them would be pullets only 112 cockerels remain. By culling down to about 50, only the very best would remain for breeding purposes.

The following year (1929) use this male with the best selected hens from the 1928 colony mating, and replace those taken out with the best birds from the flock mating. In 1929, as shown by the chart, males from the colony mating are used on the flock mating, and the same operation is done in 1930 with the resulting line bred progeny in 1931. In this way, the valuable blood lines of this valuable male are bred into all of the birds on the farm.

#### Can Linebreed Without Effort

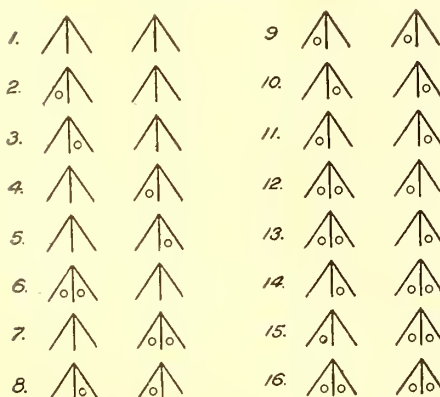
Here is a breeding operation, not complete in all details of course, but in which male 683 is again the great grandsire on the dam's side and grandsire on the sire's side of the progeny developed. There has been no need of trapnesting or pedigreeing, although it is necessary to keep the colony eggs separate from the flock eggs at the time of incubation.

This is easily accomplished by using a wire basket made of one-fourth inch wire and about three inches high in the incubator. Make it square so that it fits in the incubator tray, and see that it does not interfere with the thermostat. Then cut a piece to fit over the top of this basket and you are ready to set the eggs. If you mark the colony eggs they need not be placed in the basket until the 18th day of incubation. Then you proceed as usual.

#### Toe Punch Colony House Chicks

When the chicks are hatched, take the colony house chicks out, and toe punch them for identification so that you can select the colony house males for future matings. Toe marking of baby chicks at hatching time has a number of advantages.

If all the chicks hatched at one time are given a certain toe mark, and all the chicks in the following hatches given another distinctive toe mark, then, in the fall by handling the birds the exact age of every individual can readily be ascertained. If an efficient toe punch is used for this purpose, a large number of baby chicks can be punched in a short time. The following system is one commonly used to designate age or pen:



That is all there is to it, very little additional work, yet this is constructive breeding.

#### Then Get Unrelated Male

When this male gets too old, a new one from an unrelated blood line should be secured. To fuse the two blood lines, this new male should be mated to fifteen full daughters of the first male. A mating of that sort will produce cockerels that have 25 per cent of the old male's and 50 per cent of the new male's blood in them. These birds can be used to continue the linebreeding program. Selection and intelligent mating must always accompany such breeding operations.

This scheme can readily be used by the poultryman who has 500 or more birds. The only difference being that it is necessary for him to have two colony houses instead of one, in order to get a sufficient number of chicks to use.

The breeder can expand these operations by keeping daily colony and flock records, and getting the yearly average for each. This average can be written into the pedigree. It will also tell the breeder whether or not there has been any improvement.

One could go a step further and trapnest the colony birds, keeping the individual hen records for the year, and thus have a better basis for the selection of the males. This expansion could be continued until all birds are trapnested and pedigreed. The system would remain the same and all of the matings would be made in exactly the same manner.

#### HOW TO GET GOOD HATCHES

One of the chief causes of a poor hatch is chilling the eggs before they are placed in the incubator. During cold weather the eggs should be gathered at least three times daily and stored in a room with a temperature between forty-five and sixty-five degrees.

Eggs older than ten days should not be used for hatching whenever it can be avoided, although I have had good hatches from eggs over two weeks old. Such eggs must have strong germs and be kept under proper conditions. Eggs that are to be kept longer than three days should be turned every day to prevent the yolk from sticking to one side and becoming hard.

#### Turn Every Day

Whenever a large number of eggs are to be handled I pack them in egg cases and turn them half over every day. In selecting the eggs I use only such as are uniform in size, shape and shell texture, rejecting all that show imperfections of any kind. They should never be washed but if slightly soiled may be cleaned by rubbing lightly with a cloth dampened with water.

A good hatch cannot be expected from stock that is not healthy, vigorous or has been improperly housed or fed. Overcrowding, lice, mites, lack of green feed or insufficient exercise are all important factors which lower the vitality of the flock and render them unfit to produce good hatchable eggs.

It should be remembered that a mongrel flock of chicks will require just as much feed and care as a flock that has the characteristics of good production born in it. For this reason it will pay us well to gather our eggs for hatching from a flock that is pure-bred and is known to be of good breeding.—B. C.

#### USE THE STATE POULTRY DEPARTMENT

Every state supports a poultry department which carries on research work to determine the best methods of poultry keeping for the particular state. The poultry keepers of every state should make use of their poultry department by sending for the state bulletins and writing to the extension men.

At this time of the year, poultrymen would do well to write for a chick raising program. Without a doubt, their state department has a program suited particularly to their climatic conditions. Here is a list of agricultural colleges and their addresses:

Alabama Polytechnic Institute, Professor John E. Ivey, Auburn, Ala.  
 Arizona University, Professor Harry Embleton, College of Agri., Tucson, Ariz.  
 Arkansas College of Agriculture, Professor Robert M. Smith, Fayetteville, Ark.  
 California College of Agriculture, Doctor W. A. Lippincott, Berkeley, Calif.  
 Colorado Agriculture College, Professor O. C. Ufford, Poultry Specialist, Ft. Collins, Colo.  
 Connecticut Agriculture College, Professor Wm. F. Kirkpatrick, Storrs, Conn.  
 Delaware University, Professor H. S. Palmer, Newark, Del.  
 Florida College of Agriculture, Professor N. W. Sanborn, Gainesville, Fla.  
 Georgia State College of Agriculture, Professor J. H. Wood, Athens, Ga.  
 Idaho College of Agriculture, Professor C. E. Lampman, Moscow, Idaho.  
 Illinois University, Professor L. E. Card, Poultry Husbandry, Urbana, Ill.  
 Purdue University, Professor C. W. Carrick, Lafayette, Ind.  
 Iowa State College of Agriculture, Professor H. A. Bittenbender, Chief Poultry Husbandry, Ames, Ia.  
 Kansas State Agriculture College, Professor L. F. Payne, Manhattan, Kans.  
 Kentucky University, Professor J. Holmes Martin, College of Agr., Lexington, Ky.  
 Louisiana College of Agriculture, Professor Clyde Ingram, Poultry Specialist, Baton Rouge, La.  
 Maine College of Agriculture, Professor O. M. Wilbur, Orono, Maine.  
 Maryland University, Professor R. H. Waite, Head of Dept., College of Agriculture, College Park, Md.  
 Massachusetts Department of Agriculture, Professor John C. Graham, Head of Dept., Amherst, Mass.  
 Michigan Department of Agriculture, Professor C. G. Card, East Lansing, Mich.  
 Minnesota University, Professor A. C. Smith, College of Agriculture, St. Paul, Minn.  
 Mississippi A. & M. College, College of Agriculture, Professor E. P. Clayton, Jackson, Miss.  
 Missouri University, Professor H. L. Kempster, College of Agriculture, Columbia, Mo.  
 Montana State College of Agriculture, Professor Geo. B. Goodearl, Bozeman, Mont.  
 Nebraska College of Agriculture, Professor F. E. Mussehl, Lincoln, Nebr.  
 New Hampshire College of Agriculture, Professor A. W. Richardson, Durham, N. H.  
 New Jersey State Agriculture College, Professor Willard C. Thompson, New Brunswick, N. J.  
 New Mexico College of Agriculture, Professor L. N. Berry, State College, N. Mex.  
 New York State College of Agriculture, Professor J. E. Rice, Ithaca, N. Y.  
 North Carolina State College of Agriculture, Professor B. F. Kaupp, Raleigh, N. C.  
 North Dakota Agriculture College, Professor O. A. Barton, Fargo, N. D.  
 Ohio State University, Professor E. L. Dakan, College of Agriculture, Columbus, Ohio.  
 Oklahoma Agriculture College, Professor R. B. Thompson, Stillwater, Okla.  
 Oregon State Agriculture College, Professor A. G. Lunn, Corvallis, Ore.  
 Pennsylvania State College, Professor H. C. Kandel, School of Agriculture, State College, Pa.  
 Rhode Island State College, Professor C. E. Brett, Kingston, R. I.  
 Clemson Agriculture College, Professor C. L. Morgan, Clemson College, South Carolina.  
 South Dakota State College of Agriculture, Professor G. L. Stevenson, Brookings, S. D.  
 Tennessee Poultry Department, Professor J. C. Snow, Stahlman Bldg., Nashville, Tenn.  
 Texas A. & M. College, Professor D. H. Reid, College Station, Texas.  
 Utah Agricultural College, Professor Byron Alder, Logan, Utah.  
 Vermont University, Professor Harold A. D. Leggett, State College of Agriculture, Burlington, Vt.  
 Virginia Agricultural College, Professor A. Lawrence Dean, Blacksburg, Va.  
 Washington State College, Professor John S. Carver, Department of Agriculture, Pullman, Wash.  
 West Virginia University, College of Agriculture, Professor Horace Atwood, Morgantown, W. Va.  
 Wisconsin University, Professor J. G. Halpin, Department of Agriculture, Madison, Wis.  
 Wyoming University, Professor Frank J. Kohn, College of Agriculture, Laramie, Wyo.



# Breeding Increases the Egg Yield

If a thoughtful breeder follows approved methods

By V. S. Asmundson

*In charge of breeding operations, University of British Columbia*

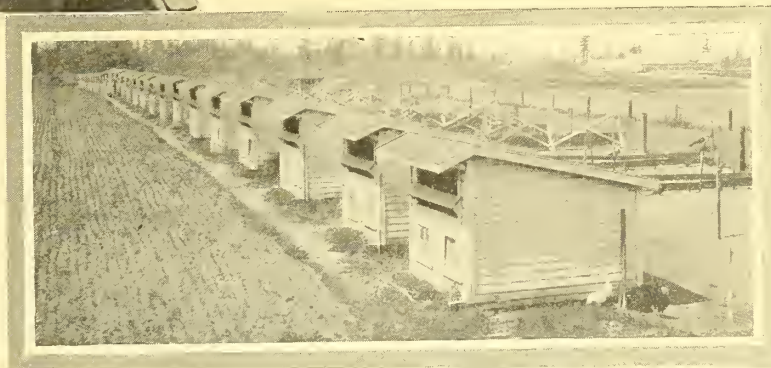


Mr. Asmundson bred the world's highest official record hen which he is holding. She laid 351 eggs in 365 days at a Canadian contest.

the story of the performance of a hen at the nest for a year or longer. It tells whether she laid continuously, and at a high rate during the winter months, whether she laid well during the spring and summer months, and whether she continued to do so without going broody or molting, until late in October. This is important, because the number of eggs laid in 265 days is not sufficient to tell the whole story.

means continuous egg production during the winter months, and a 365-day record of 250 or more, white-shelled eggs which weigh, on the average, two ounces each, or over. It means further that these hens are non-broody, weigh four pounds or over, and are in every respect typical White Leghorns. To insure the maintenance of these standards requires accurate records and careful observation.

The average egg production of a flock may undoubtedly be increased by mating these supposedly "best" females to males from similar hens. More certain and rapid progress is, however, made if the chicks are banded and a record kept to show their parentage, for when pedigree records are kept it is invariably found that the progeny of certain matings are superior to the progeny of other matings,—superior in that they surpass the average for the flock.



In order to progress in breeding work, small units must be used. Here is a row of breeding pens at the University of British Columbia.

## Progeny Testing Selection Guide

Progeny testing may be used in several ways as a guide when selecting birds to mate. In the first place, by retaining the male and female whose daughters are better than the average, and repeating the successful mating; in the second place, by selecting the cockerels whose sisters give greatest promise, to head next year's breeding pens; and lastly, when selecting for breeding purposes the hens that have finished their first laying year by giving preference to those that belong to superior families, as measured by the performance of all the individuals tested.

## How to Mate Selected Birds

Pedigreeing may be used, as indicated, to aid in the intelligent selection of birds for the breeding pens. Since pedigrees show the relationship between different individuals (and families), they may be used to assist in deciding what families to use in each mating.

This is important, because comparatively few individuals, and still fewer families, are free from at least minor defects. The pedigree records, by revealing the strong and weak points in each family, assist in mating to correct faults, and therefore

make it possible to eventually build up strains of birds possessing only the desired characteristics.

Since perfection is rare, the object to keep in mind when mating is to secure a maximum of desirable qualities, with a minimum of defects. If birds did not carry hidden defects, the logical plan to

THERE are two methods by which egg yields may be increased. One is to modify the inherited characteristics of the flock by intelligent breeding; the other is to modify the environment by improvement in management. In other words, egg yield may be increased by manipulating the interacting forces of heredity and environment. Both these forces are important, but since heredity changes more slowly, great stress should be laid on breeding, for unless this is done improvement in management will not yield maximum results.

Breeding can properly be divided into two phases, selection and mating. Selection may be thought of as the sorting out of the inherited characteristics that we seek, mating is the combining of these characteristics for transmission to future generations.

## How to Select Breeders

When breeding for increased egg production, either or both of two methods for selecting birds may be used. One method is to handle and observe the birds, to determine which ones start to lay early and continue to lay over a long period. The other method is to trap-nest, and this latter has come to be accepted as the more accurate way to identify the good layers. Since it is unprofitable, and a waste of time to trap-nest defective birds, all pullets should, like those entered in Canadian Record of Performance, be carefully examined before they are leg-banded for trap-nesting.

The trap-nest record, if complete, tells



At Hollywood Poultry Farm, breeding is reflected in the filled egg pails. Here is a Hollywood employee bringing in a share of the day's lay.

## Several Factors Need Consideration

The hen that has laid well in every month throughout the year, that has laid eggs of the right size and color, and that is herself of the right size and typical of the breed is the bird to select for the breeding pen. In the case of White Leghorns selected for breeding at the University of British Columbia, this



follow would be to mate together closely related individuals possessing the qualities sought.

#### Mixed Blood Gives Trouble

In practice, however, this does not always work well, apparently because birds are so heterogeneous (mixed) in their hereditary make-up that most of them carry recessive or hidden defects, which are revealed in the progeny when closely related individuals are mated together. If distantly related birds are mated together, these defects are gradually eliminated, with little immediate economic loss.

The many excellent individual and flock records now consistently and frequently made indicate that many breeders have succeeded in virtually eliminating from their flocks the low producer and the bird that lays a small egg. As a single example, three pens of ten birds entered in the British Columbia Egg Laying Contest last year (1925-26) completed the year with all birds qualified for registration, which meant that all of them laid over 200 eggs of the right color, that weighed on the average two ounces or over.

The gains which have already been made can be maintained by means of "tested" matings. Still further improvements are most likely to be affected by intelligently mating the best individuals from families which possess special merit.

#### Set an Average Goal

Averages for the flock are the best index to the progress so far made. Averages for the best families may be used as the objectives to reach in the near future, whilst records for individuals may conceivably show to what level the flock can eventually be brought.

Looked at from the standpoint of present accomplishment and future possibilities, a few records may be interesting. In six years, the average first year egg production of the White Leghorn at the University of British Columbia has increased to approximately 220 eggs each. The best family (six full sisters) laid on the average 254 eggs.

At the same time, the highest record made on the University poultry plant was 317 eggs, while the highest record made in a contest was 352 eggs.

The production of the flock of Rhode Island Reds has in the same period of time increased to approximately 210 eggs, with individual records up to 307 eggs. These records would seem to indicate that the breeding methods briefly indicated above had not only produced substantial results but have also opened up interesting possibilities for the future.

### SHORT LUMBER REDUCES POULTRY BUILDING COST

Build poultry, milk, feed, and hog houses out of short lumber when possible. It can be bought 15 to 35 per cent cheaper than long lengths.

According to B. M. Stahl, specialist in farm buildings at the Ohio State University, farmers are wasting millions of dollars every year by cutting a long board in two when two short ones would answer. Boards less than eight feet long have a reduced sale value because it is habit to specify long pieces in buying.

The original bill for a poultry house 20 feet wide and 80 feet long specified all long lumber. It was possible to use short lumber in half the places, according to a second specification made by the United States Department of Commerce.

## Provide a Sun Parlor for the Baby Chicks

Never before in the history of the poultry industry did baby chicks have a better chance to live and grow than they have during 1928.

The unceasing interest of investigators unfolded the secret of raising baby chicks successfully. Better incubation, more favorable brooding conditions, and better feed mixtures were one by one made available for baby chicks. However, all the improved methods failed to accomplish satisfactory results until the value of vitamins and their source was definitely established.

For many years it was noted that baby chicks developed a sickness called leg weakness, but it was only in 1920 that the cause of leg weakness was definitely established. The Wisconsin and the Kansas Experiment Stations, working along the same lines, found in 1920 that there was a life giving element in the rays of the sun without which normal development in baby chicks could not very well be expected. With a definite clue in hand, both stations went to work and placed the cause of leg weakness.

#### Chicks Would Not Grow Indoors

Early investigations into the cause of leg weakness, disclosed the fact that chicks given free run on open ranges, developed normally, while chicks confined in houses, behind closed doors and windows, developed this malady and failed to make proper growth. Basking in the warm sun which entered the brooder house through window glass failed to prevent leg weakness and led to investigations which proved definitely that ordinary window glass filters out the ultra-violet rays which carry the Vitamin D so essential to normal growth.

The first advice of investigators was that chicks should be permitted free run so that they may absorb beneficial vitamins from the sun. The trend towards earlier brooding, however, made the practice of giving chicks free run impossible. They had to be kept indoors where temperature conditions were proper for healthy existence. The advice that windows be opened to permit the direct rays of the sun to reach the chicks also proved impractical and early brooding was staring failure in the face.

#### New Invention Saves Chicks

Window glass substitutes came to the rescue. Glass substitutes are penetrated by the beneficial rays of the sun and are, therefore, ideally adapted for use in brooder houses and laying houses as well. They also have the additional advantage of being flexible and cheaper than window glass.

In order to demonstrate the efficiency of window glass substitutes, the Ohio Experiment Station conducted a series of experiments with baby chicks. Five lots of 21 chicks each were used in experiments. Lots one and two received absolutely no sunlight in order to check on the efficiency of window glass substitutes. Lot three received 30 minutes of direct sunlight each day in a sun parlor covered with wire netting only. Lot four received 30 minutes of sunlight daily, through a screen glass substitute, and lot five 30 minutes of sunlight every day through a fabric glass substitute. The experiment was run for 13 weeks.

Of the total of 31 hours of exposure to sunlight through glass substitutes, or through the wire netting, only 21 hours or approximately 20 minutes of each exposure represented sunlight. The rest of the time it was cloudy and the value of exposure was doubtful.

#### Sun Parlor Proves Valuable

At the end of 13 weeks there was no appreciable difference between lots three, four and five, indicating that window glass substitutes admitted enough ultra-



This is the way the sun parlor in the Ohio Experiment Station was built. Any poultry man can buy a few yards of a glass substitute and build a similar parlor to save chicks.

violet rays to produce growth equal to that attained in pens which received direct sunlight. In these three lots, only four of the chicks died during the entire duration of the experiment. The control chicks which were being raised without sunlight, on the other hand, showed heavy mortality. At the end of the 13 weeks only 15 of the 42 control chicks were alive, and they were only half as heavy on the average as the birds which were getting sunlight through glass substitutes or by direct sunlight.

#### Give Chicks Chance to Grow Properly

This experiment shows the value of window glass substitutes in rearing baby chicks. It suggests that each and every brooding house ought to be equipped with such window material, if maximum profits are expected from these chicks. It also points out that a sun parlor similar to that employed in the Ohio experiment would be of decided benefit in the raising of chicks without undue mortality. The fact that chicks raised with the aid of ultra-violet rays made twice as rapid growth as those raised without, proved that window glass substitutes can pay for themselves not only in reducing mortality, but in increasing growth.

While the experiment mentioned was run with baby chicks only, it may also be expected that similar benefits can be derived in a laying house equipped with window glass substitutes.

You may have good enough birds for competition in egg laying contests. If so enter some, if not, try to improve your flock by rigid culling, and by buying first class males.



In Conclusion—

# Well Kept Flocks Make Good Profits

Lessons from Missouri Poultry  
Demonstration Farms

By **Berley Winton**

University of Missouri



Mrs. H. L. Van Meter's flock of certified White Wyandottes, Corder, Mo. Picture taken in June, 1927. Accurate poultry records have been kept on this farm for the last several years. The average production for 202 hens on this farm in 1926 was 154 eggs.

**C**ERTAIN Missouri farmers know how much their farm flock makes for them. They keep chickens because their chickens make money for them.

In the fall of 1917, twenty-four such farmers began to cooperate with the Missouri Agricultural Extension Service in the keeping of monthly records on their poultry flocks. The number has increased gradually so that we now have over three hundred flock owners keeping records annually for every month in the year.

Poultry record keeping has become a permanent practice on many Missouri farms. The value of this habit to the individual may manifest itself at the end of the year in either a contraction or an expansion of the poultry operations—depending largely upon whether or not a reasonable profit was made from the business.

## Flocks Are Larger

A study of these records shows that the size of the flocks has increased from an average of 114 hens per farm in 1918 to 187 in 1927. This increase in the number of hens kept per farm is more than twice the increase that took place on the average Missouri farm for the same time. This, as we will presently show, was probably due to the remarkable net income derived from this phase of the farm business.

The production per hen has increased from 100 eggs in 1918 to more than 142 eggs per hen in 1927. This improvement in egg production is evidently due to a combination of factors such as more intelligent breeding, more comfortable housing, proper feeding and good management.

## Records Teach Systematic Breeding

The keeping of accurate records taught farmers the value of consistent culling throughout the year as well as to follow a systematic breeding program. It gave rise to Certified Poultry Breeding in Missouri. This plan of flock improvement is based upon the principle that the mating of selected, standard bred, high producing females to vigorous pedigreed males tends to increase the production and improve the quality of the offspring.

In order to determine the benefits derived from following the certified breeding plan records for certified and non-certified flocks of the light breeds have been tabulated separately. A comparison of these two classes reveals the following facts:—That certified flocks were larger by forty hens; that the certified breeders had more money invested in houses, equipment, and fowls; that the certified hens produced an average of 148.5 eggs, whereas, the non-certified hens only produced 130.7 eggs per year; that the net profit for certified flocks was \$651.15 per farm while that of the non-certified flocks amounted to \$521.85 per farm or a difference of \$129.30 in favor of certified breeding.

These poultry records indicate that there was a 43.71 per cent reduction in the size of flocks during the year. This, less ten per cent for mortality, signifies that approximately 33 per cent of the hens were sold as culls during the year.

## Each Dollar Brings Two

Each record keeping flock owner had an average investment of \$290.39 in poultry houses. The feed cost per farm for each year has amounted to \$270.65 or \$1.79 per hen. These figures on feed

cost include home grown feeds figured or market prices as well as feeds bought. They also include the value of feeds used in raising the young stock.

The average income per farm for the nine year period amounted to \$661.61 or \$390.96 over feed cost. A return of over \$2.00 has been made for every dollar's worth of feed fed to these farm flocks.

It is interesting to note that 70.72 per cent of the total income was derived from the sale of eggs. The remaining 29.28 per cent of the income was from the sale of fowls.

## Heavy or Light Breeds

A comparative study between the heavy and light breeds shows, among other things: that there were nearly twice as many hens of the light breeds per farm as heavy breeds; that a smaller per cent of the light breeds were culled during the year; that the average annual production per hen was 139.2 eggs for the light breeds and 120.2 eggs for the heavy fowls; that the profit per hen was \$2.61 for the light breeds and \$2.81 for the heavy breeds; that the net profit per farm was \$577.97 for the light breeds and \$330.51 for the heavy breeds.

It was also observed in this study that as the average egg production per hen increased the feed cost and the income per hen also increased.

## Corn Leads as Feed

According to these farm records, corn is the principal poultry feed. The following table shows the actual amount of the various feeds fed during the year to the average flock on which records were kept.

## WHOLE GRAINS

Corn.....	6151 pounds	42.0 per cent
Wheat.....	1271 pounds	8.6 per cent
Oats.....	1416 pounds	9.6 per cent
Miscellaneous.....	803 pounds	5.4 per cent
(Kafir, Milo, or Cane Seed)		
Totals.....	9641 pounds	65.5 per cent

## GROUND GRAINS

Bran.....	1495 pounds	10.1 per cent
Shorts.....	991 pounds	7.2 per cent
Mill Feed.....	872 pounds	5.9 per cent
Corn Meal.....	276 pounds	1.9 per cent
Miscellaneous.....	587 pounds	4.0 per cent
Total.....	4221 pounds	29.1 per cent

## PROTEIN FEEDS

Meat scraps.....	238 pounds	1.6 per cent
Tankage.....	435 pounds	3.0 per cent
Milk.....	150 pounds	1.0 per cent
Total.....	823 pounds	5.6 per cent

(Continued on page 32)

## SUMMARY OF MISSOURI DEMONSTRATION FARM POULTRY FLOCKS 1918 TO 1927, INCLUSIVE (University of Missouri—College of Agriculture)

Year	No. of Flocks	Ave. No. of Hens Per Farm	Ave. Eggs Per Hen	Income Per Farm	Cost of Feed	Income over feed cost per farm	Income per hen	Feed Cost per hen	Income over Cost per hen
1918	24	114	100	\$544.60	\$264.14	\$280.46	\$4.78	\$2.29	\$2.49
1919	65	134	106	577.40	257.74	319.66	4.30	1.92	2.38
1920	138	125	114	695.21	265.57	429.64	5.50	2.14	3.42
1921	168	144	125	629.00	214.00	415.00	4.85	1.41	2.94
1922	289	154	129.4	587.16	201.95	385.24	3.80	1.30	2.50
1923	296	156	128.6	637.67	251.98	385.69	4.08	1.61	2.47
1924	279	172	133	690.54	301.26	389.28	4.05	1.75	2.30
1925	330	180	134	812.13	364.12	448.01	4.51	2.02	2.49
1926	327	184	130	780.82	312.14	468.68	4.24	1.70	2.54
1927	318	187	142	776.31	365.57	410.44	4.15	1.96	2.19

NOTE—These flock owners send a record of their poultry activities to the Agricultural Extension Service each month.

(Editor's Note:—These figures are extremely valuable because they represent actual farm conditions. We may conclude that at least these farmers know how much profit their poultry pays. It will pay you to keep records like these.)



The average farm fed 1,400 pounds of skim milk which was assumed to be the equivalent of 150 pounds of tankage or meat scraps. In addition, the average farm fed 208 pounds of oyster shell, 36 pounds of grit and 8 pounds of bone meal. It will be observed that two-thirds of the ration was made up of grain feeds and one-third was mash. This is practically the proportions recommended by the University of Missouri with the exception of protein concentrates. Even there the actual practice comes within one per cent of the University recommendations.

#### Highest Mortality in Spring

The general opinion of poultry keepers is that the highest mortality of the mature stock occurs during the late fall and winter months. This idea is apparently based upon the belief that chickens die mostly from roup and closely allied diseases.

In order to accumulate information as to the rate of mortality and the time of year it takes place, a study of records from 538 demonstration farm poultry flocks in Missouri has been made. There were 105,317 hens and pullets on these different farms for the period of six years over which the study was made. There were 207 flocks or 54,026 birds of the light breeds and 331 flocks or 51,291 females of the heavy breeds.

The mortality of the laying flock, month by month, for the entire period of six years, 1919-1925, shows a wide variation. The range was from .44 per cent in November to 1.24 per cent in May.

The extremely low mortality for November may be accounted for by the fact that these flocks were generally culled closely once or twice during the summer or early fall. At this time, no doubt, birds that indicated a lack of vigor and vitality were eliminated from the flock.

The highest death rate actually took place during the spring and early summer months. The maximum mortality, 1.45 per cent, for any one month for the entire period occurred in May, 1925.

The following table gives the total and the per cent of mortality by months:

Months	Light Breeds	Heavy Breeds
November.....	.44%	.35%
December.....	.76	.48
January.....	.96	.72
February.....	1.05	.71
March.....	1.04	.98
April.....	1.01	1.08
May.....	1.24	1.20
June.....	1.13	.87
July.....	1.19	.94
August.....	.86	.96
September.....	.76	.82
October.....	.70	.65
Total Mortality.....	11.14%	9.67%

This study indicates less than two per cent difference between the rate of mortality for the light and heavy breeds during the six-year period.

No attempt was made to determine the cause of mortality but it seems that it is closely associated with high egg production or ovarian activity.

Mrs. F. A. Millard, Kingsville, Missouri, is one of Missouri's most successful poultry breeders. She states that the keeping of records means to her what bookkeeping means to the merchant or manufacturer. "It gives us a line up on our business. It has made it possible for us to increase our production from 115.5 eggs per hen in 1917 to 200 eggs per hen in 1927."

## FOR WINTER EGGS, MAKE THE HENS EAT MORE

By D. C. Kennard

**P**ROFITABLE winter egg production is always associated with heavy feed consumption. The amount of feed consumed is a direct index to rate of production. When the feed consumption of a flock is heavy it means the majority of the birds either are or soon will be laying.

A hen requires five or six pounds of feed a month just to live. For profitable egg production she must eat about a pound more. Whether the birds are induced to eat the extra pound a month depends largely upon the ration and method of feeding. Little profit comes from the first five pounds of feed unless the extra pound is also consumed. The profit, therefore, comes mostly from the additional one pound per month. Hence profitable egg production, especially during winter, depends largely on how much feed the poultry keeper can induce the fowls to eat. He may increase feed consumption in a variety of ways. No set rule will serve poultry keepers in general, as each is surrounded by different conditions so that he must develop a procedure best adapted to his requirements. However, there are certain principles which have a general application and some of these will now be considered.

#### Making the Layers Eat More

1. *Feed a complete ration.*—A ration deficient in any respect lessens the fowl's appetite.

2. *Employ a mash the birds like.*—The palatability of a mash depends upon the ingredients and their quality. A mash made mostly of granular material is more readily consumed than when finely ground.

3. *Use a suitable type of mash feeder* and supply 20 to 24 feet of eating space for each 100 layers. The reel mash feeders made 7 to 11 inches wide and 4 inches deep on inside are well adapted for this purpose.

4. *Feed fresh mash daily* in the evening in about the amount that will be consumed before the next feeding. The birds relish fresh mash and if it is fed in the evening they will go to roost with better filled crops. During severe winter weather a small amount of fresh mash can be fed to advantage in the morning and at noon.

5. *Milk* in some form is an appetizer and usually aids in securing greater feed consumption. It is also a valuable addition to the ration for its nutritive properties.

6. *Lights* in the poultry house aid in securing increased feed consumption by making the days longer. Any of the methods for use of lights may be employed to advantage.

7. *Moist mash* may prove beneficial, especially if skillfully used. The skill and extra labor necessary for success with moist mash may make its use questionable, in some instances. Moist mash fed without the proper skill and judgment often does more harm than good. However, if properly managed, a moist mash can be used to considerable advantage for the layers during the later summer, fall, and winter months.

#### Methods of Feeding Moist Mash

*Mixing water or milk* with dry mash to form a slightly moistened or crumbly

mixture is the usual method of preparing moist mash.

*Wetting by pouring or sprinkling* water or milk on the mash in the feeder is another method. Altho not often employed it is simple, avoids the trouble of mixing, and perhaps requires no more or even less skill than the usual method. The mash in feeder is smoothed over before wetting so as to leave it about an inch higher at the sides and ends of the feeder. This provides a sort of trench or receptacle for the water or milk and prevents it from coming in contact with the mash box. The desirable depth of dry mash is about 1 inch in center and 2 inches at side and ends of the box. The amount of water or milk to be added will vary but it usually will range from ½ to 1 gallon per 100 birds. A ten-quart sprinkling can is very convenient for wetting the mash.

If any of the wet mash adheres to the box it should be scraped loose the next morning, so the hens will eat the moist portion before it becomes sour or musty. A small hand scraper about eight inches long with blade about three inches wide is very convenient for this purpose. Since the birds relish the wet mash mixture very much, skill and careful judgment must be exercised in feeding it.

#### Time To Feed Moist Mash

With either method probably the best time for feeding the wet or moistened mash is just before the birds go to roost so their crops will be well filled for the night. Some prefer feeding the wet mash at noon. When the evening lunch procedure of using artificial lights is followed, undoubtedly evening would be the best time. Even if the caretaker chooses to mix the moist mash rather than let the hens do it, as in the case of the wetting method, no separate boxes or troughs are required, provided there is ample feeding space (20 to 24 feet per 100 layers) for the dry mash. Simply, put the moistened mash in the mash feeders on top of the dry mash. This makes a clean place for feeding it and should there occasionally be a small amount left over in the evening the birds will eat it the first thing in the morning. For best results with either procedure during cold weather hot water or milk should be used.

A moistened mash when fed regularly makes a desirable way of administering cod-liver oil in the ration. Two to four ounces of the oil can be added directly to the moist mash for each 100 layers daily. This obviates mixing the oil in with the dry mash and avoids any chance for deterioration after it is mixed with the dry feed.

#### Watch Grain Proportions

The foregoing suggestions are intended either for the all-mash or the scratch grain and mash methods of feeding. When scratch grain is fed separately considerable attention should be given to the proportion of mash to grain.

The birds naturally eat the grain more readily if given the chance and consume proportionately less mash. So it is important when scratch grain is fed separately to employ some means to induce the birds to eat more mash. Hence the same suggestions apply to both methods of feeding.

Finally it should be emphasized that for profitable winter egg production the poultry keeper must not only feed a complete ration but he must endeavor to secure the additional consumption of feed required for producing eggs, and maintenance of body weight during cold weather.



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